JANUARY 1956-SIXTY-SECOND YEAR

MACHINERY

G BROS. TOOL CO

ARMSTRONG TOOL HOLDERS

to Cut Cutting-Costs

Machining high precision magnesium castings on a production run with an ARMIDE Carbide Tool Bit in a No. T-3-R ARMSTRONG Tool Holder. The ARMSTRONG System of Tool Holders provides permanent, cost cutting tooling for most turning operations. ARMSTRONG Tools are carried in stock by leading Industrial Distributors.

Brust Fool Mig. Co. Franklin Park, Ill.

Seple" CHICAGO, U.S.





permit important cost savings and give new flexibility on fully automated production lines

Simplified sketch of typical transfer-type automated production line for performing multiple operations on relatively large work. Setup includes horizontal, vertical and angular mounting of individual Slide-Unit machines—each a completely self-contained unit.



Typical arrangement of automatic, conveyor-fed production line for performing multiple operations on smaller work. Any number of identical Slide-Unit machines can be provided in each work station, to give the required overall production rate.

These simple, compact, hydraulically operated Heald Slide Units — each complete with boringhead and drive — are ideally suited to a wide variety of automated production lines. They can be mounted in any position from vertical to horizontal and can approach the work from any angle. This simplifies the design and operation of automatic workhandling, clamping and locating equipment — permits each work station to be arranged for the most efficient and economical operation.

In an automated line, each Slide-Unit Bore-Matic is a separate and completely self-contained machine, arranged through interlocking control circuits to function as a fully automatic segment of the entire production line. Hence in-

dividual machines can be added as required, permitting full automation to be achieved on an economical basis of planned expansion.

This new precision finishing development is another good reason why IT PAYS TO COME TO HEALD.



THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago · Cleveland · Dayton · Detroit · Indianapolis · New York

MACHINERY Editorial, Advertising and Circulation Offices 93 Worth St., New York 13, N. Y.

Editor CHARLES O. HERB

Associate Editors
FREEMAN C. DUSTON
CHARLES H. WICK
EDGAR ALTHOLZ

Assistant Editor
RAYMOND H, SPIOTTA

Book Editor HOLBROOK L. HORTON

THE INDUSTRIAL PRESS
Publishers

ROBERT B. LUCHARS

EDGAR A. BECKER
Vice-President and Treasurer

HAROLD L. GRAY
Secretary and Publishing Manager

Advertising Representatives
WALTER E, ROBINSON
DWIGHT COOK
93 Worth St., New York 13, N. Y.

GEORGE H. BUEHLER 228 N. LaSalle St., Chicago 1, III.

NORMAN O. WYNKOOP, Jr. 15937 W. Seven Mile Road Detroit 35, Mich.

DON HARWAY & COMPANY 709 W. Eighth St., Los Angeles 17, Calif.

MACHINERY, published monthly by The Industrial Press, Emmett St., Bristol, Conn. Executive offices, 93 Worth St., New York 13, N.Y.

Subscription Rates: United States and Canada one year, \$4; two years, \$7; three years, \$8,6 foreign countries, one year, \$7,7 two years, \$13. Single copies, 50 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address. Copyright 1956 by The Industrial Press.

Entered as second-class mail matter May 25, 1953, at the Post Office at tistol, Conn., under the Act of March 3, 3, 9, Printed by Hildreth Press, Inc., Bristol, Conn., U. S. A.

> British Address MACHINERY National House, West St. Brighton 1, England

French Address

LA MACHINE MODERNE
15, Rue Bleue
Paris-IXe, France

BPA

fork



MACHINERY

Volume 62

JANUARY, 1956

NUMBER 5

The Monthly Magazine of Engineering and Production in the Manufacture of Metal Products

SHOP PRACTICE

	Automation of Crankshafts Speeds Plymouth V-8 Production	100
	Axle Production Doubled with Automatic Cycling Lathes	123 147
	Automatic Milling Machine Built Around Indexing Table	151
	All-Inclusive Testing of Tubing at 250 Feet per Minute	153
	Rolling Sheet Metal into Housings for Washing Machines By Herbert Chase	154
	Recommendations for Grinding Titanium with Abrasive-Coated	
	Belts	156 158
	"Merry-Go-Rounds" Speed Rubber Forming	
	By Lyle Boarts and Eugene Searcy "Squirt Welding" Accelerates Fabrication of Heavy Steel Compo-	162
	nents	167
	Buick Cold-Forms Serrations on Hardened Shafts	177
M	ACHINE AND TOOL DESIGN	
	Accurate Punching Controlled from Cardboard Template	
	By Charles H. Wick Knowledge of Decarburization Dangers Safeguards Tool and Die	134
	Performance	138
	Performance "Gerac"—A New Method of Gear Finishing By Fred Bohle	142
	Cutter and Coolant Influence Screw Machine Design	100
	By Claude R. Morgan Silent Ratchet Mechanism for Over-Running Drive	165
	Bu H. B. Schell	171
	Blocking Device for a Geneva Wheel	172
	By O. Lichtwitz	173
	Fixture for Gaging a Recessed Flange By W. M. Halliday Two Improved Designs for Woodruff Key-Slot Gages	174
	By L. W. Lazariek Milling Fixture Automatically Clamps and Releases Small Work	175
	By Alex S. Arnott	176
	Formulas for Calculating Replacement Helical Gear Dimensions	211
A	ANAGEMENT PROBLEMS AND EVENTS	
••		
	Recent Machine Tools May Have Inspired Government Inaction	110
	What's Ahead for 1956? By Charles O. Herb	119 121
	Tool and Die Manufacturers Elect New Officers	157
	Broadening of the Product Lines By Bernard Lester	181
	DEPARTMENTS	
	eeping Up with Washington 119 The Latest in Shop Equipment	182
	Shops Around the Country 160 Data Sheet	211
	aterials of Industry 169 Between Grinds	218
n	genious Mechanisms 171 New Catalogues	221
1	ool Engineering Ideas 174 News of the Industry	226
100	alking with Sales Managers 181 Coming Events	236
	Book Reviews 239	

Product Directory 248



Advertisers Index 343-344



Cutting, Grinding, Tapping,







Cutting....

The 8C LANDMACO—one of five new Thread-Cutting machines designed for precision threading of workpieces from \(\frac{3}{6} \) to \(\frac{5}{6} \) in diameter. \(\tilde{\tilde{A}} \) Above is the new 2" LANDMATIC—one of the many Standard and Special Thread-Cutting Heads designed for application to Automatics and Turret Lathes.

Grinding....

The CENTERLESS Thread Grinder for continuous thrufeed grinding of threads from $\frac{1}{16}$ " to 2" in diameter at mass production rates. Infeed grinding attachment available for threading shouldered or headed workpieces which cannot be cut or rolled due to material hardness.

Rolling THREADS

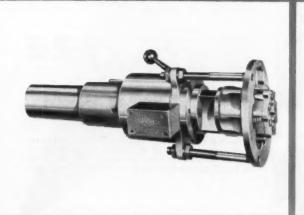
More than 350 sizes and styles of Machines and Tools are manufactured by LANDIS for producing all types of internal and external, straight and tapered threads by one of these three basic threading methods.

This extensive line of Threading Equipment is the result of more than 50 years of research and development—exclusively in the field of Thread Generation. Our most recent additions include the revolutionary LANHYROL Thread Rolling Machine, the new Model C LANDMACO Bolt Threading Machines, and the #1 Automatic Nipple Threading Machine. We are the largest company in the world today devoted entirely to manufacturing equipment for producing threads—by Cutting, Grinding, Rolling, or Tapping.

The Threading Experience developed through these years is an important LANDIS extra available to all manufacturers. Our Engineering Department will be glad to work with your organization on any problem dealing with method, equipment, or thread design. Send us your specifications—let us recommend the Threading Equipment best suited to your need.

LANDIS Machine COMPANY

WAYNESBORD . PENNSYLVANIA . U.S.A.





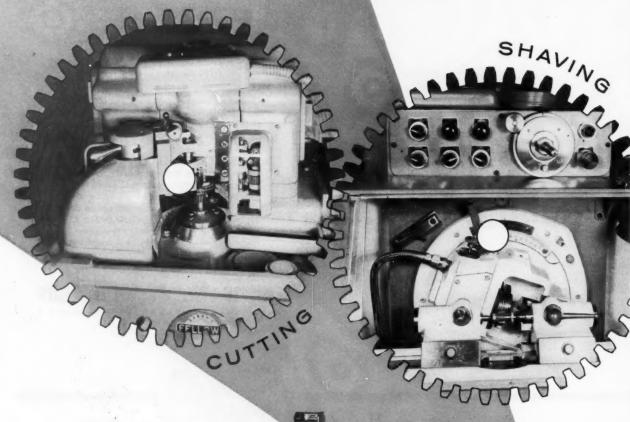
Tapping....

The LL Collapsible Tap for producing internal tapered threads featuring detachable heads for wide range coverage. Other LANDIS Taps include Rotary or Stationary Standard Taps for straight or tapered threads, Solid Adjustable Taps, Valve Taps, and Taps for other special applications.

Rolling....

The new LANHYROL Thread Rolling Machine, revolutionary in its output, accuracy and flexibility. Above is the #20 LANROLL Attachment—one of five sizes of Thread Rolling Attachments for Automatics and Turret Lathes,

FULLY INTEGRATED





Fellows 3-inch Gear Shaper will handle work from 1/16" to 3" pitch diameter and as fine as 200 pitch on spur gears. It provides for unusually high speeds...automatic deburring, too.

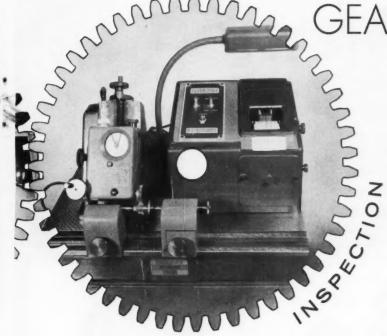
Fellows No. 4 Gear Shaving Machine provides the fastest possible finishing on spur and helical gears from 1/16" to 4" pitch diameter, 1" face width, 20 diametral pitch and finer. The last word in quality.

Fellows No. 4 Red Liner is especially adapted to the "composite check" of fine-pitch precision sears. Electrical recorder amplifies errors 200, 400 or 800 to 1 and records them on a paper chart. Very 1 st!

THE PRECISION LINE

PRODUCTION

FOR FINE-PITCH
GEARS, TOO



At the NMTB Show, gear men had the opportunity to see for themselves how quantity production of high precision fine-pitch gears can be achieved at low cost. Using a Fellows 3-Inch Gear Shaper, No. 4 Fine-Pitch Gear Shaving Machine and No. 4 Red Liner...all fully integrated...production speeds can be obtained that a short time ago were considered impractical. Simultaneously, close tolerances can be assured which will meet the most exacting gear-train requirements for electronics and instrumentation.

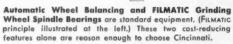
If you are interested in fine-pitch gears...either as a producer or user, or both... it will certainly pay you to get all the facts about Fellows line of fully integrated equipment. WRITE, WIRE or PHONE any Fellows Office today!

THE FELLOWS GEAR SHAPER COMPANY.
Head Office and Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1 • 6214 West Manchester Avenue, Los Angeles 45.

FELLOWS Gear Production Equipment











High degree of accuracy is easier to obtain than ever before because of the new infeed unit.



CINCINN

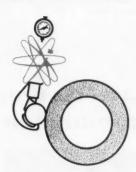
CENTERTYPE GRINDING MACHINES . CENTERLESS GRINDING MACHINES CENTERLESS LAPPING MACHINES . MICRO-CENTRIC GRINDING MACHINES

Plain Hydraulic Grinders in Your Shop

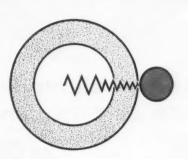
Speculation in precision and production has no place in today's metalworking shops. You can quickly end the guesswork where it hurts most . . . in your precision cylindrical work. Just install new CINCINNATI FILMATIC Plain Hydraulic Grinders in your shop and you'll have definite production that you can count on year after year, and within closer limits of accuracy than ever before. ¶Sev-

eral Cincinnati features that help you attain these highly desirable results are illustrated below. These and many other features, translated into benefits for your shop, are outlined in two attractive catalogs: G-660 for the 6"R and 10"L machines; G-661 for the 10"R and 14"L machines. Write for copies.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



Automatic electric gage sizing (extra) includes an exclusive Cincinnati advantage . . . automatic compensation for wheel wear and truing.



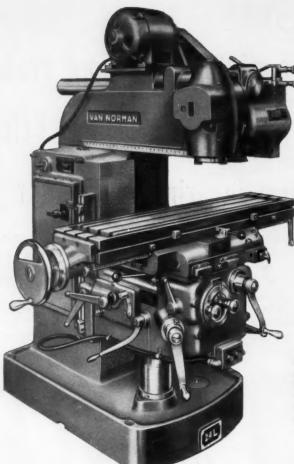
Gap eliminator . . . greatly reduces time spent in "cutting air" during automatic infeed grinding operations. (extra)



This one is a 6"R x 18" machine, equipped with automatic push-button infeed and electric gage sizing. Members of this family group of CINCINNATI FILMATIC Plain Hydraulic Grinders are:

Sixe 6"R)	Between-Center Lengths	Catalog
10"L	18" and 30"	G-660
10"R) 14"L)	18", 36", 48" 72" and 96"	G-661

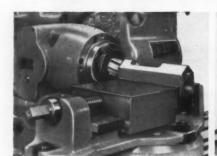




No. 24 L...

one of 10 new Van Norman Ram-Type Millers. Table Size: 45" x 10½" Cutterhead Motor: 3 HP Ram Travel: 29"

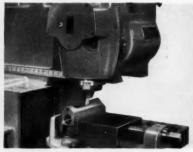
Here's how you eliminate idle machine time by as much as 50%...increase production



HORIZONTAL — A typical horizontal milling operation performed on the new Van Norman Ram-Type Miller.



ANGULAR — An angular milling operation performed on the same workpiece. Note workpiece remains in the same set-up. Angular range of cutterhead 0°-90″.



VERTICAL — With the cutterhead locked in vertical position a slot is milled in the workpiece. Note the set-up has not been changed.

VAN NORMAN

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

You Don't Need
TWO

Single-Purpose Machines plus

Attachments when

ONE
VAN NORMAN
Ram-Type Milling Machine
Does the Same Work

at Lower Cost

A single investment in one Van Norman Ram-Type Milling Machine gives you the equivalent of two separate millers plus attachments at the much lower cost of a single machine. Not only do you save machine purchase dollars, but with a Van Norman you get in-

creased production with substantial savings in milling costs.

10 new models with cutterhead motors ranging from 1½ HP to 10 HP and table sizes from 37½"x 9¾6" to 64"x 14" give you a wide range of selection. Write for complete information today.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export.

COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-9

Only Landis grinders have "rigidized" bearings and spindles

- maximum production
- fine finishes
- high precision

"Rigidized" Microsphere Bearings

One piece bearings have extremely close clearance between spindle and bearings. Gives accurate work and quick, positive sparkout.

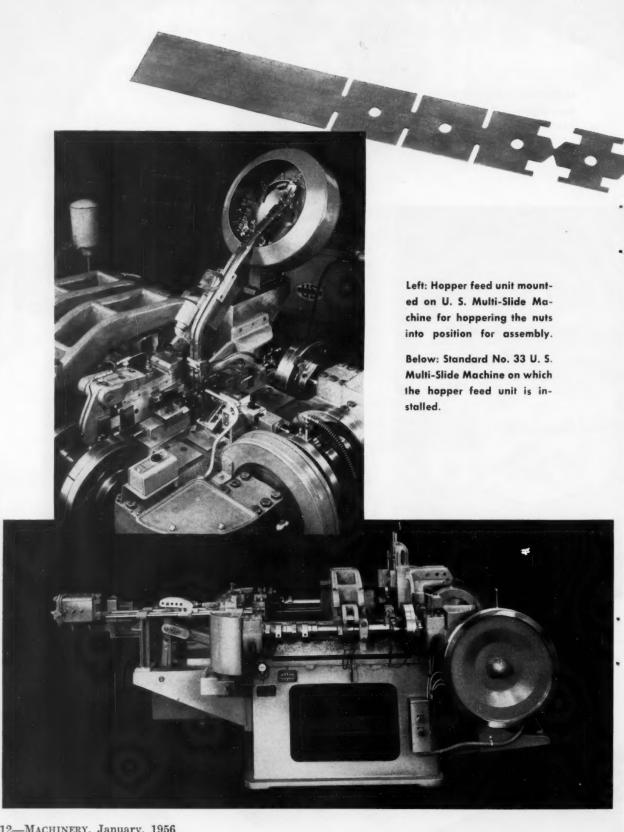
"Rigidized" Spindle

Because the diameter of the spindle between bearings is increased, you can take heavy cuts without loss of accuracy or finish.

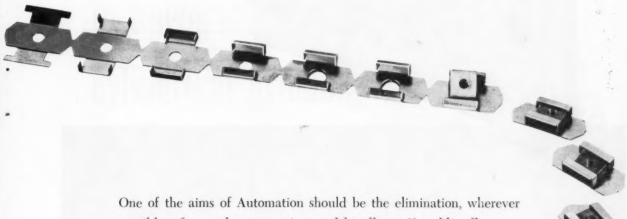
LANDIS

precision grinders





Automation in Stamping Production Illustrated on the U.S. MULTI-SLIDE



One of the aims of Automation should be the elimination, wherever possible, of secondary operations and handlings. You, like all manufacturers, are interested in attaining this result. The U. S. Multi-Slide can be the answer in the production of stampings.

The sequence-of-operations strip pictured above shows how a complete assembly is produced on the U. S. Multi-Slide without secondary operations. The finished assembly is an automotive fastener comprised of a sheet metal stamping and a nut. The stamping is produced on the U. S. Multi-Slide and the prefabricated nut is hopper-fed into proper position for automatic assembly. The complete unit is produced at the rate of 100 per minute—without handling.

The elimination of secondary operations results in reduced cost per piece, an all-important factor in today's competitive market. If you produce stampings and are interested in low piece part costs, why not investigate the use of U. S. Multi-Slide Machines? Ask for Bulletin 15-M giving complete specifications.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

Now...

The New SWIVALIGN on a Norton 12" Type U-4 Universal Grinder. This latest Norton improvement adds to the speed and flexibility with which this popular grinder handles an almost endless variety of jobs.



Another Norton "TOUCH of GOLD" Development for faster, better, lower cost grinding. The swivalign Dual Electric Indicator, set up to measure swivel table adjustment on a Norton universal grinder. By eliminating the usual time-wasting cut-and-try adjustments and guesswork it saves grinding time and money.

New Norton Swivalign*

device eliminates cut-and-try

in universal and cylindrical grinding



Dual electric indicator measures swivel table adjustment, saves time and work

Again Norton shows the way with a new device to simplify grinding operations and cut production costs.

The SWIVALIGN, available for Norton universal and cylindrical grinders, enables operators to adjust the angular positions of swivel tables quickly and accurately, eliminating the cut-and-try procedure normally required.

The swivalign consists essentially of an electric pick-up unit with a zero adjuster at each end of the swivel table, and a two-channel amplifier with a pair of indicating needles reading on a common scale. Each needle responds to movement of one of the pick-up elements. Both needles move in the same direction of rotation as the swivel table.

Divisions on the meter scale indicate taper changes in thousandths of an inch per foot of taper. Two ranges of readings are provided — one for extremely accurate settings with graduations of .0001" per foot and the other of .0005" per foot of taper change. The desired range is obtained by a convenient selector switch.

Simple, accurate operation

When the error in taper has been determined, the pickup adjusting screws are used to set the two needles on the instrument to the required taper correction. The swivel adjustment on the table is then made to move the table until both needles meet at zero on the meter scale.* One particular SWIVALIGN advantage is that each end of the table registers its own movement. If one needle fails to move, or lags behind the other, it indicates the table is deflected and the work centers out of alignment — which condition should be corrected. Furthermore, since the corrections made are based on the positions of the needles which register taper per foot, the position of the work in relation to the swivel pivot does not affect the operation of the device.

For further facts

on the new Norton SWIVALIGN, and on its application to Norton universal and cylindrical grinders, see your Norton Representative, or write direct. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5,

SWIVALIGN—Norton trade name for Dual Electric Indicator for accurate measurement of swivel table adjustment.

To Economize, Modernize with NEW



GRINDERS and LAPPERS

Making better products... to make your products better

District Sales Offices:

Worcester • Hartford • New York Area, Teterboro, New Jersey

• Cleveland •

Chicago

Detroit

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-15

Top quality at low cost... Kearney & Trecker

3 hp No. 2 - 71/2 hp No. 3

Model CE

plain and universal milling machines

Designed specifically for EFFICIENCY, EASE and ECONOMY of operation

HERE'S Kearney & Trecker's answer to industry's need for a new milling machine that combines quality with low initial cost. The new Model CE's give you the three most wanted features—Efficiency, Ease and Economy of operation. What's more, these machines can be obtained under Tool-Lease.

The economical Model CE's are available in either No. 2 (3hp) or No. 3 (7½hp) size — both in plain and universal styles. The

CE's feature 16 quick-change speeds (25 to 1300 rpm) and feeds (½ to 25 ipm). They are ideally suited for a wide variety of applications — especially for small tool shops, repair and maintenance shops and vocational training schools.

For the full story, contact your nearest Kearney & Trecker representative, or write: Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.

Kearney & Trecker Corporation





it's the greatest advancement in OBI press history

FRONT-TO-BACK

ALL NEW rugged, front-to-back crankshaft with huge crankpins compact, fully concealed driving mechanism

ALL NEW enclosed, rigidly supported gearing in sealed oil bath

electro-pneumatic friction clutch on crankshaft

ALL NEW wider spaced, longer, narrower gibs

wider, box type slide all within gibbing

ALL NEW precision, hardened, longer-wearing gears

Add Many compact, straight-line, space-saving frame

Hailed as the greatest achievement in modern OBI press design and performance, by over 100,000 spectators who examined this mechanical marvel at the Machine Tool Show, the all-new Niagara Series E, Single Point, Open Back Inclinable Press starts a brand new chapter in press history.

It's years ahead of any OBI ever built. It's an industrial revolution all by itself. No other press, in modern times, embraces so many "All-New" features.

Gone are exposed, overhanging gears, flywheel and other mechanisms. Gone is excessive and damaging crankshaft deflection. Here to stay are: Full support to wide dies, Greater

For General Purpose Production

resistance to off-center loading. Accurate alignment of slide, with minimized tendency to cock. Substantially increased die life, Longer lasting, hardened gears. Smoother, safer press performance. Smaller floorspace requirements.

Built in 4 sizes, with shaft diameters from 4½ to 7½ inches and capacities from 75 to 200 tons, the new Series E is available in both standard models and automation models equipped with the most advanced controls and devices for peak production. A complete description of both, with full specifications,

For Automation Lines

is given in new Bulletin 56, sent promptly on request.

SEND FOR NEW BULLETIN . .

NIAGARA MACHINE & TOOL WORKS . BUFFALO 11, N. Y.

DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia

Dealers in principal U. S. cities and major foreign countries.

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work.

耳-OBI an) STANDARD DESIGN MODIFIED DESIGN Winter Taps perform with

Balanced action

giving you very high hole accuracy

giving you very high hole accuracy

with long tool life. Only Winter

with long tool life. Only Winter

makes Balanced action Taps.



EXACT FLUTE SPACING



UNIFORM FLUTE CONTOURS



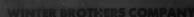
PRECISION CHIP



ACCURATE AND CONCENTRIC CHAMFERS



CALL YOUR WINTER DISTRIBUTOR



WINTER

Dushautan Michigan II C A

Ofstributors in principal cities. Branches in New York - Detroit - Cleveland - Chicago Dalles - Son Francisco - Los Angeles - DEvisios of National Twist Drill and You Co.







CALL YOUR NATIONAL DISTRIBUTOR Continuing metal cutting research in our Rochester laboratories results in (1) Better methods of tool use-and (2) Constant improvement in National metal cutting tools.

National

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Stranches in New



Twist Drills
Rearaers
Counterbores
Milling Catters
End Mills - Habs
Carbida Traped
and Special Too



22-Machinery, January, 1956

A Most Versatile Vertical

the ALL NEW Giddings & Lewis

42" Vertical Turret Lathe



- √ "joy stick" directional control and instant powered remote-control shift
- √ ability of machine to change table speeds in-the-cut or on-the-fly
- √ feed box with two working ranges of 16 feeds each
- constant cutting speed attachment (optional) giving 16 direct feet per minute rates
- √ each head with independent feed and traverse and directional controls to both ram and saddle
- several types of ram heads (fixed or swivel) and various table arrangements
- ✓ special attachments (optional) for thread cutting and geared taper turning
- swiveling turret and ram heads counterbalanced for easy motion under feed and traverse and for swiveling
- √ jet-lubrication to main spindle bearing with main motor drive. All machine elements and associated feed units are automatically pressure lubricated when in motion.

H ERE'S the Giddings & Lewis highly-versatile, new 42" Vertical Turret Lathe. And if you saw this machine in action at the Machine Tool Show, you'll agree that its revolutionary new design features are the latest — never before offered on any other Vertical Turret Lathe.

Listed above are only a few of the many outstanding features you get—improvements that permit highspeed, multiple machining operations in a single setup. For example, the centralized controls with standard coaxial micrometer dials and circular scales and "joy stick" directional control of feed and traverse, assure you greater accuracy at high speeds, simplicity of operation and reduced operator fatigue.

This all new G&L machine offers you even greater versatility with its choice of various standard heads — available as swiveling turret (five-station) or swivel-

ing ram rail heads and side head. These specially-designed heads can be used in any combination for rough and finish machining of small or large workpieces.

Another important, versatile feature includes standard table arrangements — available in plain, three- or four-jaw combination or powered chucks. Powered by a 50-hp motor drive, the table provides variable speeds from 6 to 320 rpm in 24 geometric steps in two ranges and feeds between .0007" and .576" in 20 geometric steps. What's more, the operator can change table speeds in fly or on cut — saving machining time and extending tool life.

For more information on the outstanding features of Giddings & Lewis new 42" Vertical Turret Lathe, be sure to see your nearest G&L representative. He'll be glad to give you all the details and tell you what this versatile, economical machine can do for you.



GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; Hypro Double Housing and Openside Planers;
Planer Type Milling Machines and Vertical Boring Mills; Upright and Radial Drilling Machines; and Davis Boring and Cutting Tools.

Up to 40% higher tightening torques a feature of new High-Torque Unbrako socket set screws

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES

	(1	s)	MINIMUM		
SCREW SIZE	UNBRAKO	SET SCREW	SET SCREW	DIFFERENTIAL %	
#4	5	3.9	3.5	28	
#5	9	7.8	7.4	15	
#6	9 .	7.8	7.4	15	
#8	20	14.7	14.5	36	
#10	33	26.5	25	25	
1/4	87	62	60	40	
5/16	165	122	125	32	
3/8	290	198	225	29	
7/16	430	309	350	23	
1/2	620	460	500	24	
5/8	1225	1106	1060	11	
3/4	2125	1540	1800	18	
7/8	5000	3660	4600	9	
1	7000	5025	6500	8	
* /					

Compare Unbrako-recommended tightening torques with those of ordinary socket set screws and you readily see why you can set an UNBRAKO and then forget it. The reasons are simple. UNBRAKOS have deeper sockets, which give you better purchase with the wrench; rounded socket corners, which eliminate the sharp corners where cracks start; fully formed threads, which make them stronger; and knurled cup points, which keep them tight.

Let's see just how the development of fully formed threads make the new High-Torque UNBRAKO stronger. The metal is compressed into the closely knit grain structure that you see in the illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. An UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Conversely, cut or ground threads have straight flow lines—lose thread form at root diameter.

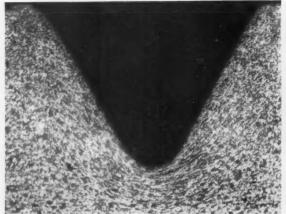
You can't buy a better screw than an UNBRAKO. And you can't get full high-torque performance without a "High-Titan" UNBRAKO Hex Keythe high-ductility, precision internal wrenching tool. See your authorized distributor today. Or write STANDARD PRESSED STEEL Co., Jenkintown 19, Pa.

STANDARD PRESSED STEEL CO.

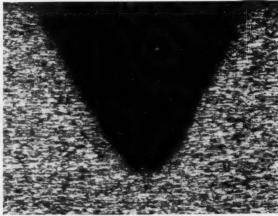




UNBRAKO SET SCREW THREADS



ORDINARY SET SCREW THREADS



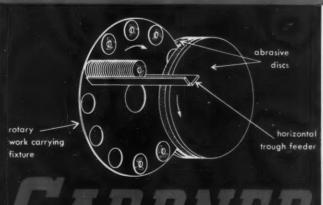
24-MACHINERY, January, 1956



Grinds 1200 flat surfaces of unequal area per hour



Grinds parallel surfaces in operation



GARDNER

precision disc grinders
BELOIT, WISCONSIN

Faster Shearing at Follansbee



 ${f T}$ he addition of a big Steelweld Pivoted-Blade Shear in the Pittsburgh warehouse of Follansbee Metals, has greatly speeded the plate service they provide.

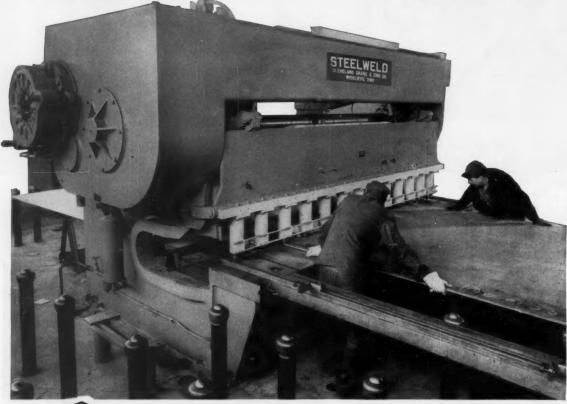
Hot rolled steel plates, stainless plates, floor plates and other metals are cut smoothly and accurately. The machine can handle mild steel up to $12'\cdot0''$ x 3'4''. The 36'' deep throat permits slitting plates 72'' wide down the middle for any length.

Because of the Micro-Set knife adjustment, it is quick and easy to properly set the knife clearance to obtain the best possible cut for every thickness. No other shear has this outstanding feature.

It was only after a thorough study of all makes of shears that Follansbee decided upon Steelweld. And it has fully proven up to expectations.

It makes the cuts as desired in metals of various characteristics. It is fast and easy to operate. All parts are readily accessible and the many adjustments provided minimize and simplify maintenance.

Steelweld Shears are the very latest and most modern on the market today with a host of points of superiority. We urge you to get all the facts on them.





GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5445 East 282 Street, Wickliffe, Ohio

STEELWELD PIVOTED SHEARS



switch

STITCH

If you are trying to patch up holes in your production schedule, then it's high time that you switched to CIMCOOL°, the world's largest selling chemical cutting fluid. Here's how CIMCOOL can save you money and increase your production.

- CIMCOOL INCREASES TOOL LIFE (and thus reduces downtime) because of its chemical lubricity.
- FASTER SPEEDS are possible because CIMCOOL cools faster, for it combines friction reduction and cooling capacity in a degree never before attained.
- CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It also cuts labor costs for cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

But these are only a few of the CIMCOOL Concentrate advantages that will help you sew up savings in your plant. Let us tell you about the other advantages—soon—and give you details on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

*Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

- CIMCOOL Concentrate—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical
- CIMCOOL Tapping Compound—Permits the use of highest tapping speeds and in-creases tap life amazingly.
- creases tap he amazing.

 CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL. Concentrate.
- Base Additive For jobs requiring an oil-base cutting fluid. Added to
- mineral oils, it gives an economical mix for higher speeds and feeds.

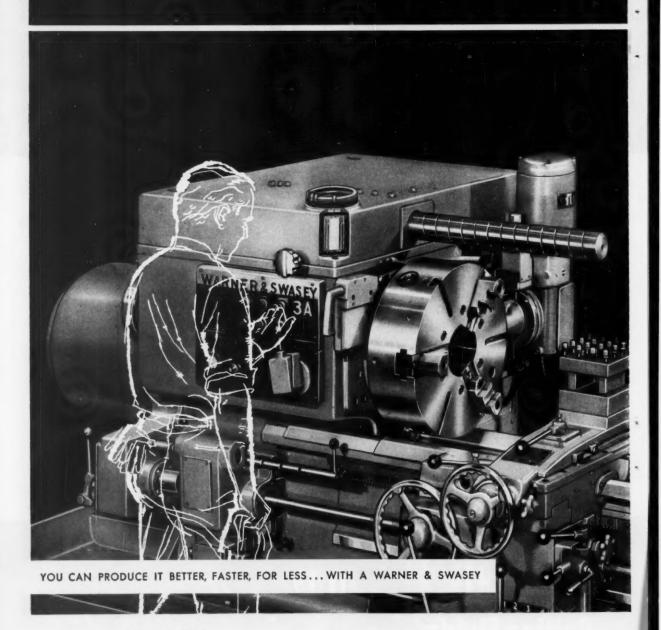
 CIMCOOL Bactericide The most effective agent yet developed to overcome rancidity and foul odors.
- CIMCOOL Machine Cleaner The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

Cutting Fluids

JL for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

BIG...POWERFUL...ACCURATE AND YET SO EASY



TO OPERATE!

WARNER & SWASEY turret lathes have become more powerful, more versatile, more accurate, more productive—and yet much easier to operate.

Operators of the new extra-heavy duty saddle types like, for example, such Warner & Swasey advantages as the ease of spindle speed selection...the effortless speed changes...the easy indexing turrets...powered rapid

traverses...zoned operating controls throughout...the high-speed hydraulic bar feed with adjustable feed-out...and bed design that permits them to stand closer and more comfortably to the work.

And, like all Warner & Swaseys, this new line of saddle type turret lathes give you traditional Warner & Swasey accuracy and dependability!

WARNER & SWASEY Cleveland PRECISION MACHINERY SINCE 1880

AUTOMATION in 91 station,
182 operation, in-line transfer machine
features four segments which can
operate independently or as a unit to
assure continuous production of automotive automatic transmission cases at
100 cases an hour at 80% efficiency

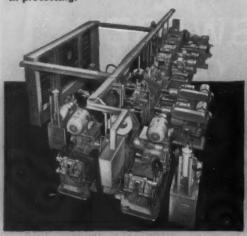
SNYDER

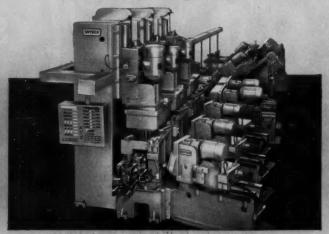
TOOL & ENGINEERING COMPANY
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

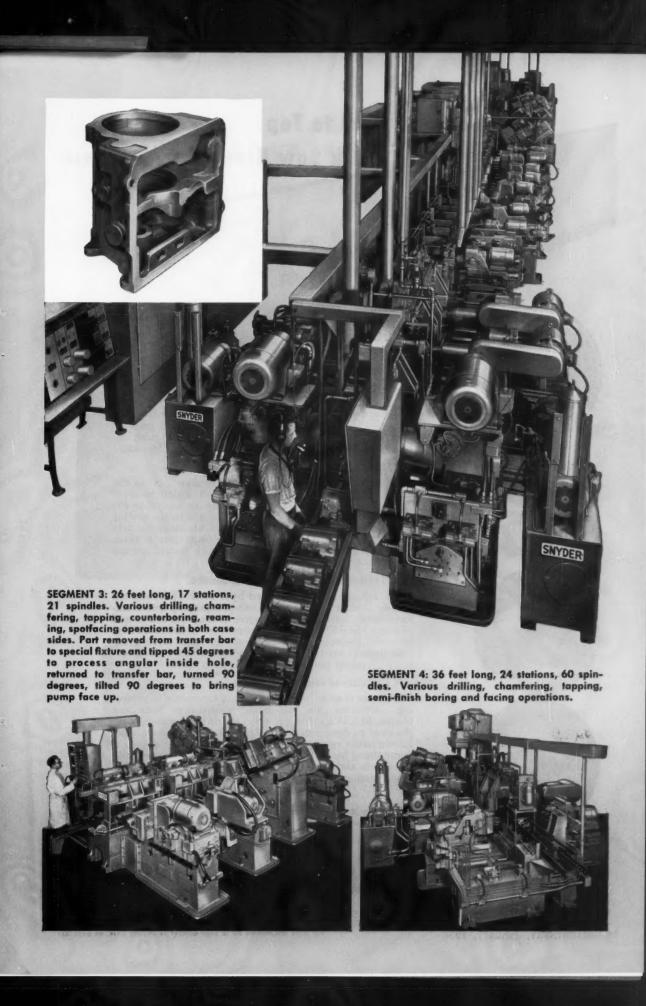
30 Years of Successful Cooperation with Leading American Industries

SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.

SEGMENT 2: 47 feet long, 31 stations, 91 spindles. In top face, end and at angular locations inside, 51 holes are drilled, countersunk, semi-finish and finish reamed, spot-faced, tapped. Part is tilted 90 degrees and rotated.

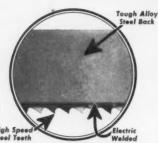






Features Essential to Top Hack Saw Blade Performance

MARVEL HIGH-SPEED EDGE
ARMSTRONG BLUM MFG. CO.
CHICAGO ZZ MADE IN U.S.A.



UNBREAKABLE-to saw FASTER.

Composite construction (a narrow high speed steel tooth edge electrically welded by the MAR-VEL-invented process to a tough, non-brittle alloy steel body), means that MARVEL high-speed-edge can be subjected to the MAXIMUM feed pressure that any hack sawing machine is capable of applying. MARVEL blades need not be "babied" for fear of breakage!



SHATTERPROOF-for SAFETY.

MARVEL blades never shatter or "explode" as do the ordinary "brittle" blades shown at left which so often cause personal-injury accidents such as the loss of an eye or severe laceration and expensive damage to the sawing machine. Operators who use MARVEL blades exclusively soon "get the habit" to apply heavier feeds, greater blade tension, higher speeds—to do their work faster, because they know they are SAFE with MARVEL.



SHARPER, PREMIUM-STEEL TEETH-to wear LONGER.

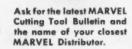
Teeth are accurately machined by a MARVEL-invented process that assures sharper tooth points and positive uniformity of tooth shape and degree of set from end-to-end of every MARVEL blade. The steel used in the tooth edge is carefully selected from the finest high speed steels available throughout the world, regardless of cost or source—truly premium steels, without premium cost.



QUALITY CONTROL-to assure UNIFORMITY.

With more than a quarter century of experience in inventing, perfecting, and producing welded-edge hack saw blades, MARVEL has provided its own laboratory with the most modern metallurgical instruments and techniques known to the applicable sciences for the specific purpose of maintaining highest possible quality control. Coupled with rigid tests and meticulous inspection of every MARVEL blade, uniform quality is assured.

These are only a few features that make MARVEL High-Speed-Edge Blades such outstanding performers



Better Machines-Better Blades

Manufactured only by

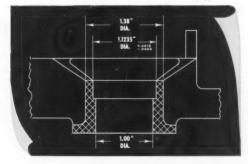
ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39 U S A.

ACCURATE LOCATING PERFORMANCE

Acclaimed By Customer with . . .



Identical machining operations on each of three holes for battery carriage are performed on the Bullard Spacer Table.



OPERATION DATA

OPERATION	SET-UP TIME	UNIT TIME	
Drill 1" dia.	.70	.2066	
Counterbore 1.1235" dia, at 1.000 dia350" deep	.25	.0566	
Face 1.38" dia.	.25	.0356	

"The machine is simple to operate.

We have found the Bullard Spacer Table very useful in our work", says a foreman at San Diego Division of Convair, "It eliminates the necessity of zeroing to a set position.

And there is no chance for error, which is important when you make accurate parts for airplanes."

This same accuracy to close tolerances can be applied to your drilling, reaming or tapping operations without the high cost of jigs or fixtures.

CALL YOUR NEAREST BULLARD REPRESENTATIVE OR WRITE FOR SPACER TABLE CATALOG TO

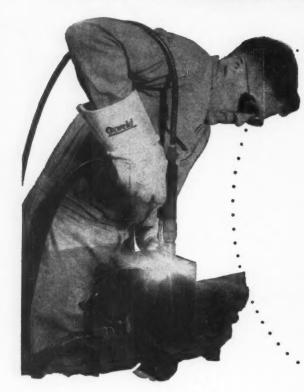
THE

BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

Spot, Plug, and Tack-Weld

with the new SIGMA SPOT-WELDING process



- * Joins metals up to 1/4-in. thick
- * Adds filler metal automatically
- * Welds from one side of the joint
- * Shields weld area with inert argon gas
- ★ Operates on Constant Potential power supply

Spot, plug, and tack-weld with one torch. With sigma spot-welding you can make strong spot welds quickly on lapping metal sheets up to ½-in. thick, plug and tack-welds on metals up to ½-in. thick—and you need access to only one side of the weld joint. Use it on carbon, galvanized, or stainless steel, and copper-base alloys.

It's easy to use. Position the "muzzle" of the watercooled torch and squeeze the trigger—the machine does the rest. A consumable wire electrode is fed into the weld area as filler metal. Inert argon gas protects the weld from the air. You can make up to 10 welds a minute, with a completely automatic welding cycle.

Constant Potential adds to efficiency. Sigma spotwelding equipment operates on constant potential power supply to give you the benefit of simplified controls, sure starting, and precise are voltage. Weldcratering and wire-sticking are eliminated. Welds are smooth and consistently uniform.

Your local LINDE representative will be pleased to give you booklet F-8778 and more detailed information on the sigma spot-welding process.

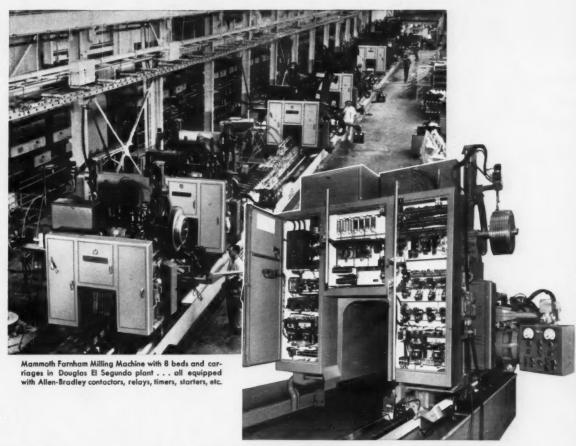
Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street III New York 17, N. Y.
Offices in Other Principal Cities

In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto
(formerly Dominion Oxygen Company)





308 FOOT MILLING MACHINE ···operated by Allen-Bradley Motor Controls























When the Farnham Manufacturing Division of The Wiesner-Rapp Co., of Buffalo, N.Y. built this impressive, 308 foot milling machine, they used Allen-Bradley control components for all 8 carriages. Thus, they assured themselves and Douglas of utmost reliability for this complex machine tool.

If you manufacture motor-driven machines, don't overlook the fact that Allen-Bradley motor controls are a big sales asset to any machine. The A-B trademark is a guarantee of trouble free performance . . . and is so recognized by machine tool buyers. Did you notice how much in evidence this trademark was at the Chicago Machine Tool Show?

Send for the Allen-Bradley Handy Catalog. It is a valuable handbook on modern motor control. Write today.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada—Allen-Bradley Canada Ltd., Galt, Ont.



ALLEN-BRADLEY A-C CONTACTORS



2 pole-Size 00 10 ampere



3 pole-Size 1 25 ampere



3 pole-Size 2 50 ampere



3 pole—Size 3 100 ampere



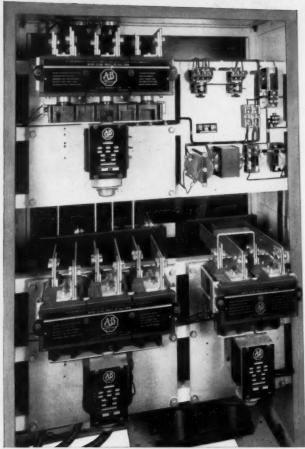
3 pole-Size 4 150 ampere



3 pole-Size 5 300 ampere



3 pole-Sizes 6 & 7 600 & 900 ampere contactors



250 Hp, Bulletin 746 automatic autotransformer showing Allen-Bradley Size 7 contactors

A-C and D-C CONTACTORS 10 to 900 Amperes with Double Break, Silver Alloy Contacts

The only complete line of solenoid contactors on the market. Allen-Bradley offers nine sizes...from Size 00 (10 amperes) to Size 7 (900 amperes), one to four poles.

There is no contact maintenance . . . no pins, pivots, or bearings to give trouble. Just one moving part—the simple solenoid plunger. Operating characteristics are consistent for all nine sizes.

Enclosures can be supplied for general purpose, watertight, dust-tight, and explosion-proof service.

Allen-Bradley controls are an added sales asset to any machine. May we send you our catalog?

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.





SIMONDS

OFFERS A

Complete Line of "Red Tang" Files

AMERICAN PATTERN
"AMERICAN-SWISS" SWISS PATTERN
"VIXEN" MILLED CURVED TOOTH
ROTARY FILES and BURRS

You can now get ANY TYPE FILE YOU NEED from one complete line — SIMONDS! The famous "RED TANG" Line now includes ALL TYPES OF FILES for every purpose: machine shop, saw filing, die making, precision craftsmen, automotive, aircraft, pattern makers, foundries, railroad and shipyards, garages and for special applications.

All are Grade A only . . . backed by SIMONDS reputation for outstanding quality, dependability and service. Call your Simonds Distributor now for ALL your file needs. Ask for "Red Tang" . . . and be sure of the best!

For Fast Service from Complete Stocks Call your
SIMONDS
Industrial Supp

WIXEN . MILLED CURVED-TOOTH

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS

American-Swiss

Factory Branches in Boston, Chicago, Sen Francisco and Portland, Oregone
Conadien Foctory in Mentreel, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila, Pa., and Arvide, Que., Canada

For more information fill in page number on Inquiry Card, on page 221

"Red Tang"®
AMERICAN
ATTERN FILES

MACHINERY, January, 1956-35



off the press

THE MOST UP-TO-DATE AND COMPLETE CARBIDE TOOL CATALOG AVAILABLE

- A completely new carbide tool catalog, shadow indexed for ready reference.
- 92 pages contain complete listings on Super Standard Carbide Tools, sizes and engineering information.
- Many new carbide tools cataloged for the first time, including an extended line of solid carbides.

SUPER TOOL CO.

21656 Hoover Road, Detroit 13, Mich.

Please send me my copy of Super catalog No. 56.

Name

Company

Address

City

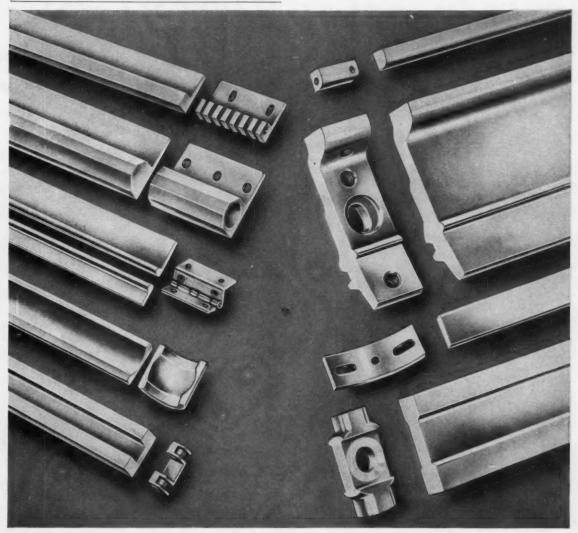
Zone

State

Tool COMPANY

21660 Hoover Rd., Detroit 13, Michigan

5210 San Fernando Rd., Los Angeles 3, California



REDUCE YOUR MACHINING OPERATIONS, REDUCE SCRAP

get a superior wrought metal product with Anaconda extruded shapes

Cost-paring possibilities unlimited: In few areas can imagination and ingenuity pay off so handsomely as when applied to the use of extruded shapes. Visualize your finished parts as cross-sectional pieces cut from a long extruded shape.

Costs come down, quality goes up: Extruded metal is wrought metal—tough, dense-grained, smooth-surfaced, and easy to machine. When you switch from cast parts, you eliminate rejects due to pits and porosity; you reduce machining, scrap...and finishing time.

A manufacturer of hosiery knitting

machines, for example, found he saved from 25-30% over cast brass. He makes 420 components from 12 different Anaconda Extruded and Drawn Brass Shapes. He also gets the superior precision, balance, and long-wearing and bearing qualities in these parts, which must operate at high speeds.

Metals: Extruded shapes are available in copper, brass, bronze, and special copper alloys—in long mill lengths suitable for feeding into turret lathes or automatic screw machines.

Our experience at your service: The American Brass Company pioneered in

extruded shapes. The accumulated experience of the organization, its wide selection of dies, may help you shortcut production and save money.

We'll be glad to make suggestions based on your sketch or sample. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA®
EXTRUDED SHAPES

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-37

at HAMILTON MFG. CO.

Two Rivers, Wis.



Home laundry clothes dryer





Steel laboratory equipment

Accurate high production, at low cost, is maintained by a battery of Cincinnati Shears—in the manufacture of Hamilton automatic washers and dryers, hospital and laboratory equipment.

These money making Cincinnati features have brought results—

- Durable All-Steel Interlocked construction.
- Automatic Pressure Lubrication.
- · Accurate Back Gauge.
- · Powerful Hydraulic Holddowns.
- · Inclined Ram.

Cincinnati Shears accurately cut various thicknesses of material, without a change in knife clearance—this is a profitable time saver.

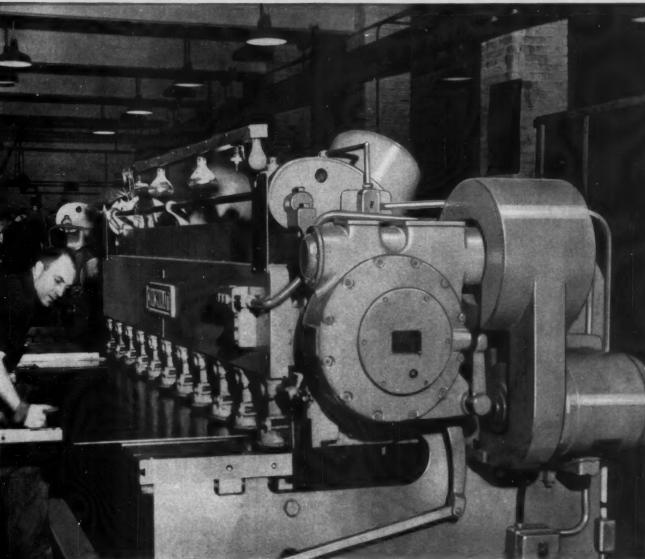
Photos courtesy the Hamilton Mig. Company, Two Rivers, Wisconsin.

New front controlled power back gauges are now standard equipment on ALL CINCINNATI SHEARS.

Investigate these modern money making tools. Write for Catalog S-7.



..25,000,000 lbs. of steel sheared by cost cutting CINCINNATI SHEARS



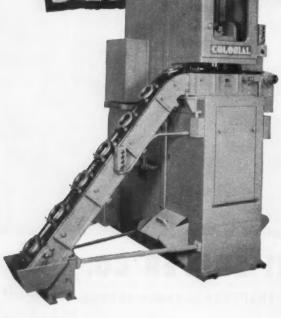
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS . SHEARS . BRAKES



CMC 6 WUX MARCH 9 1955 2:05PM

EVERY 12 SECONDS INSIDE DIAMETER ON A DIFFERENTIAL RING GEAR
IS BROACHED TO CLOSE LIMITS ON THIS AUTOMATED SETUP 100 PER
CENT EFFICIENCY GIVES A PRODUCTION OF 300 PER HOUR
OPERATOR LOADS CONVEYOR FROM FLOOR WITH FOUR STATIONS IN EASY
REACH GRAVITY UNLOADS BROACHED RING GEAR BLANKS
REPEATING 12 SECOND CYCLE IS (1) PULL-UP WORK STROKE (2)
INDEX TO RETURN POSITION (3) RETURN STROKE (4) INDEX TO BROACHING
POSITION CONTROLS ARE COMPLETELY SAFETY INTERLOCKED REQUEST
BULLETIN RU-54 FOR SPECIFICATIONS ON STANDARD 15-TON 48-INCH
STROKE COLONIAL PULL-UP MACHINE IN THIS UNIFIED BROACHING
INSTALLATION



COLONIAL BROACH

MPANY

every 12 seconds



UNIFIED BROACHING is the key to successful broaching

For Multiple Grinding specify SIMONDS ABRASIVE CO. grinding wheels in **MATCHED SETS** SIX DIAMETERS GROUND SIMULTANEOUSLY

The crankshaft grinding operation illustrated here is typical of the production economies possible with "matched sets" of Simonds Grinding Wheels in multiple set-ups.

These wheels are furnished in counterbalanced sets, each wheel identified by set number, and painted on the face with a red stripe for accurate line-up on the spindle. Matched for best balance, these sets give more uniform grinding action, better and more production.

If you grind cylindrical parts requiring more than one diameter, investigate multiple wheel set-ups. A Simonds Abrasive Engineer will be glad to help you in determining the specification and recommended procedures for your job. Write for this service today.

SIMONDS ABRASIVE COMPANY . PHILADELPHIA 37. PA.

Brench Warshouses: Besten, Demet, Chicage, Pertined, San Francisco - Dismisurers in Frincipal Chica tricion et Simonds Saw and Steel Ce., Fitchburg, Mass. - Other Simonds Companies: Simonds Steel Mills, Lockpert, M. Y., Holler Tool Compony, Newcomerstewn, O., Simonds Conada Saw Co., Ltd., Mantreal, Queboc, Lion Grinding Whoels Bitw., Brechville, Ont. and Simonds Canada Abrativo Co., Ltd., Arvide, Queboc



Another example





2nd Operation - 44 pieces

W-1139



of Blanchard versatility



653 oddly shaped, non-magnetic workpieces

Blanchard Surface Grinders are noted for their unusual versatility-like grinding small, non-magnetic stainless steel forgings in quantity. In the first operation, 653 forgings are loaded and blocked between rings on a No. 18 Blanchard, with 36" magnetic chuck (stock removal .010"). Parts, chuck and rings are sprayed with oil, and molten sulphur is poured around the parts to hold them. After grinding, the sulphur is easily stripped away.

This entire operation takes only 11/2 hours-including preparation of the sulphur.

In the second operation, 44 pieces are set in a notched steel ring. Tilting the wheelhead and maintaining wheel pressure in one direction holds these non-magnetic pieces in the notches. Stock removal from this surface is .030", to tolerance of = .003. Each load takes eight minutes - floor-to-floor. As a result of this ingenious workholding, each piece is ground on both sides in a fraction of a minute, at less than 98¢ abrasive cost for all 653! That's typical of the convenience and economy of grinding on a Blanchard -whether the parts are magnetic or non-magnetic!



Send for free copies of "Work Done on ing", 3rd edition-recently revised.

the Blanchard", 4th edition, and "The Art of Blanchard Surface Grind-

PUT IT ON THE BLANCHARD

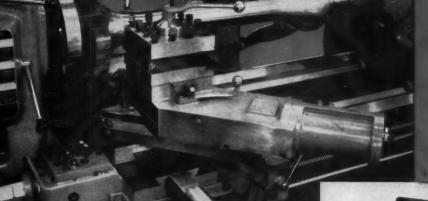
64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

THE BLANCHARD MACHINE COMPANY

42-MACHINERY, January, 1956

For more information fill in page number on Inquiry Card, on page 221

2 hrs. versus 9½ hrs.





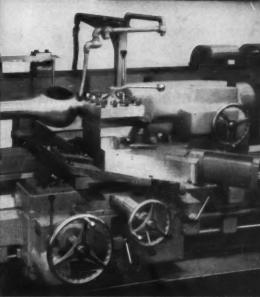
This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required $9\frac{1}{2}$ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.



THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio U.S.A.

Lathes and Radial Drills

Let DAVIS cut your Boring Costs 2 ways

WITH Standard Tooling ITEMS FROM INDUSTRY'S MOST COMPLETE LINE

IN STANDARD BORING HEADS ALONE DAVIS PRODUCES AND CATA-LOGS OVER 133 DIF-FERENT SIZES AND TYPES.

Martinetonether (1881)

Every bering job in your shop...regardless of range, material or complexity...can be done faster, cheaper and with greater precision, when you make Davis your tooling headquarters. That's because only Davis has both the complete line and broad machining experience to supply or design exactly the right tool for your work.

Davis tooling specialists help you immeasurably in selecting the right tool from industry's broadest standard line. Their unrivalled background of practical shop experience assures recommendations that exactly meet all your requirements for tolerances, finish, speeds, feeds and maximum tool life at minimum cost.

TYPICAL OF DAVIS SPECIAL TOOL DESIGNS IS THIS EX-

TENSION BORING HEAD WHICH BORES, FACES AND GROOVES A 51" DIAMETER

WITH Job-Engineered Specials
FROM INDUSTRY'S FOREMOST DESIGNERS

Where work is beyond the scope of standard tools or where efficiency can be improved or costs reduced by combined operations, special fixturing, etc., the specialists in Davis Engineered Tooling Service will work with you in developing tools for even the most complex application. Consult your local Davis field engineer or send us complete work details for impartial recommendations.

DAVIS
BORING TOOL DIVISION

of Giddings & Lawis Mathine Tool Company

THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING



VMA Universal Shaper Model ES-26



UTOMORDENTLIG YRKESSKICKLIGHET

(SUPERB CRAFTSMANSHIP)

VMA SHAPERS - built by Sweden's master craftsmen - are engineered to maintain precise tolerances in continuous heavy-duty production. Built to U. S. standards, VMA Shapers—both heavy duty and standard models — meet all requirements for modern versatile machines.

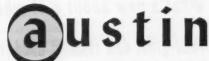
VMA Model ES Heavy Duty Shapers, available in Plain and Universal Models and with 18", 22", 26", and 28" stroke, ∉eature:

- Wide selection of ram speeds and power feeds
- Automatic forced lubrication system
- Herizontal power rapid traverse of table through independent motor
- Double helical crank gear
- Chrome nickel steel transmission
- Anti-friction bearings throughout
- Dependable safety clutch

VMA Model EV Series...economical standard-duty Shapers with stroke lengths from 14" to 24".

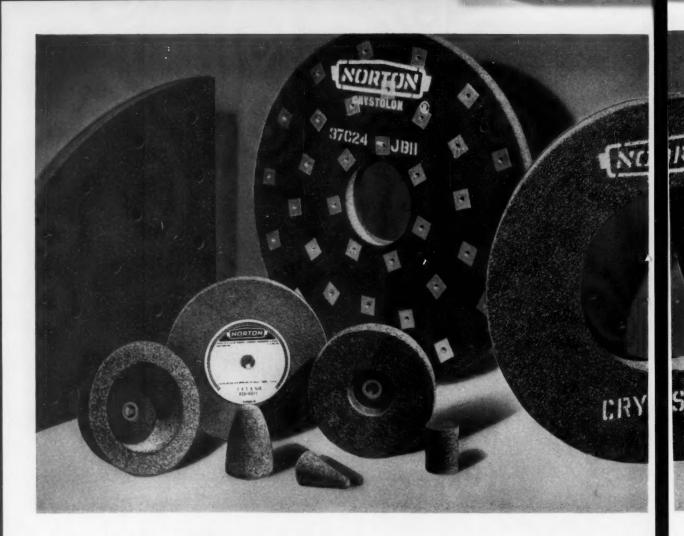
 Highly accurate and dependable, Model EV Shapers are ideal for job shap or tool room use not requiring the extra power of the ES Series.
 Easy to operate — economical to own.

ASTE Show, Chicago, Booth #550



INDUSTRIAL CORPORATION

76-E MAMARONECK AVENUE . WHITE PLAINS, NEW YORK

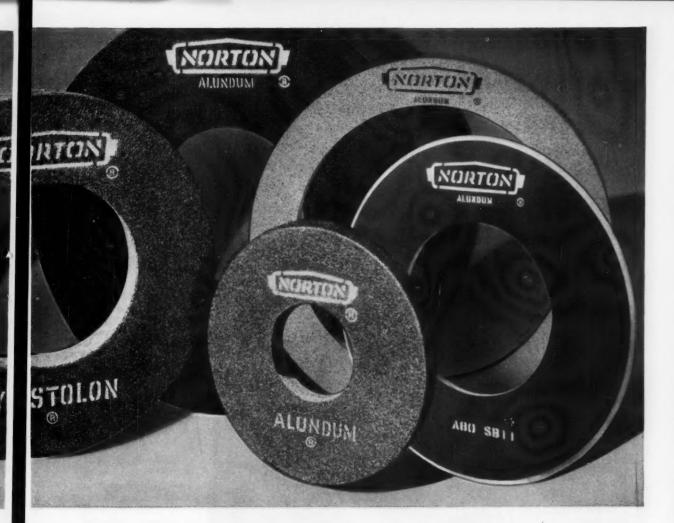


Q. What's new in grinding?

A. B-11 resinoid-bonded wheels —for many grinding jobs

Q. What's new about B-11 wheels?

A. Their great new resinoid bond, improved uniformity and balance, new "TOUCH of GOLD" performance-benefits



Q. What is the B-11 bond?

A. It's the latest Norton resinoid bond. Wheels made with it are excellent for snagging, disc grinding, heavy weld grinding, thread grinding, cam grinding, centerless grinding, roll and surface grinding.

Q. Why?

A. Because B-11 wheels are more uniform in structure, with better balance. As a result, they grind cooler and faster. And on portable machines they "hug that work" closer, with less vibration and bounce.

Q. What about those "Touch of Gold" benefits?

A. They're the direct result of the B-11 wheels' more efficient grinding action. In precision grinding this means improved surface finish, greater accuracy, more pieces per dressing. In rough grinding it means less operator-fatigue and longer wheel life. All these benefits add up to more profitable grinding for you.

Q. Any other advantages of B-11 wheels?

A. Many others. For example you get closest possible duplication. Hardness increments are evenly spaced throughout the entire grade scale. And B-11 wheels can be supplied in half-grade increments, making it even easier for you to choose exactly the right wheel for every job.

Q. Sounds fine - what about more information?

A. Your Norton Distributor will gladly give you the whole story on the new B-11 wheels. Or write us direct. Norton Company, Worcester 6, Mass. Distributors in all industrial areas, listed under "Grinding Wheels" in your phone book, yellow pages. Export: Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W-1676



Making better products . . . to make your products better

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding
Machines • Refractories

BEHR-MANNING DIVISION: Coated Abrasives • Sharpening
Stones • Pressure-Sensitive Tapes

For more information fill in page number en Inquiry Card, on page 221

MACHINERY, January, 1956-47

Electrical Discharge Machining produced this multiple cavity In

This Elox equipped Vertical · GRINDS . DIE SINKS · ROUTS MACHINES MULTIPLE CAVITIES unparalleled efficiency and savings

conventional machining time

hours



Multiple Cavity in coolant retainer tank of Vertical Mill. Machined automatically without operator attention or broach cost.

Finished die and brass electrode. Die Material: Hi Chrome Die Steel. Tolerances: +.0005"-.000 Finish: 15-20 micro inch.

> Our engineering staff is always ready to help solve your specific machining problems. Representatives in your area will arrange appointments, at your request, for grinding, die sinking and cavity forming operations at EDM Demonstration

corporation of michigan

1833 Stevenson Highway

Royal Oak 3, Michigan

DEMONSTRATION CENTERS: Plant-Clawson, Mich.

45 Broad Ave., Palisades Park, N.J. 1907 W. Monterey, Chicago, Ill.

*T.M. Reg.

Lubrication is automatic on Sundstrand's "Engineered Production" machine tools

FARVAL— Studies in Centralized Lubrication No. 182

The idea behind Sundstrand "Engineered Production" Service makes sense: Manufacturer and Sundstrand Engineers work closely together to find the best processing method for the job at hand. The result is the same as you experience with a custom-tailored suit—it fits.

FARVAL fits Sundstrand pattern

Farval Centralized Systems of Lubrication, like Sundstrand Machine Tools, are engineered for the job. Where there are bearings to be lubricated, Farval will make sure the job is done correctly. That's why Sundstrand chooses Farval—and why other machine-tool specialists are doing likewise.

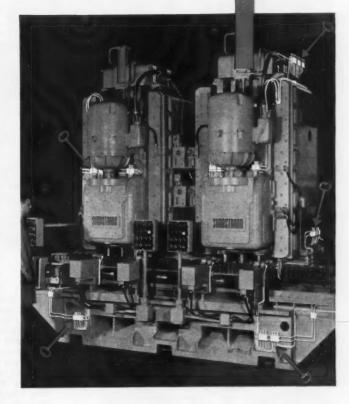
It works like this: As the Dualine system of centralized lubrication, Farval delivers a measured amount of clean lubricant at regular intervals to every bearing in the Farval circuit. From a centrally located pump and reservoir, lubricant is pumped under pressure, to a measuring valve at each bearing. The exact amount of lubricant required by the bearing is delivered to it. And, indicators at every bearing show positive proof that each valve has functioned.

Let Farval help you

Lubrication problems that seem tough for you are a cinch for Farval. One of our lubrication engineers will be glad to inspect your plant and present a written analysis of what Farval can do for you. This service is without obligation, of course. If you'd like the complete Farval story, just write for Bulletin 26-R. The Farval Corporation, 3276 East 80th Street, Cleveland 4, Ohio.

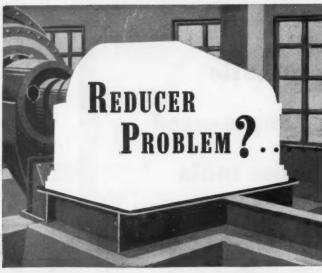
Affiliate of The Cleveland Worm & Gear Co., Industrial Worm Gearing. In Canada: Peacock Brothers Limited.



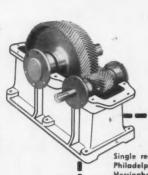


This is a Sundstrand two station rough boring unit for 6 cylinder engine blocks.

KEYS TO ADEQUATE LUBRICATION—Wherever you see these Farval valve manifolds, dual lubricant lines and central pumping station, you know a machine is being properly lubricated.



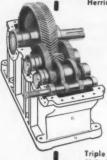
· consult



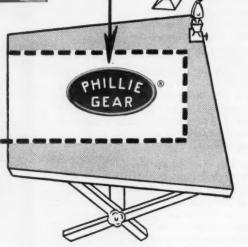
Single reduction Philadelphia Herringbone Reducer



Double reduction Philadelphia Herringbone Reducer



Triple reduction Philadelphia Herringbone Reducer



If you have a problem involving high horsepower speed reduction with heavy shock loads, Philadelphia Herringbone Reducers are the answer. These quality-built units are available in Single, Double and Triple Reduction types, offering a wide selection of capacities and reduction ratios. The continuous tooth type herringbone gears assure evenly distributed pressure over each tooth from the top to the working depth line, — which means exceptionally long life, minimum vibration, quiet operation and maximum transmission of power... Thousands of Philadelphia Herringbone Reducers are in daily use, in most every line of industry. Be convinced, send for Catalog H-49.

HILADELPHIA EAR WORKS INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

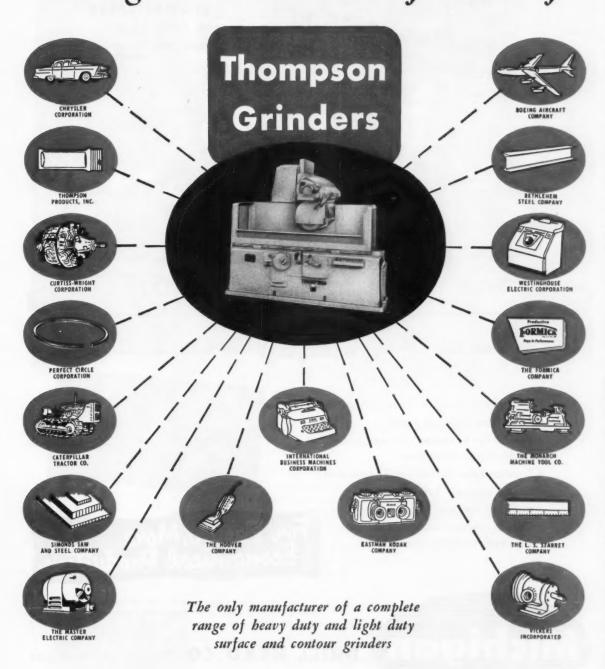
NEW YORK . PITTSBURGH . CHICAGO . HOUSTON . LYNCHBURG, VA.,

BALTIMORE • CLEVELAND Virginia Gear & Machine Corp., Lynchburg, Va.

Industrial Gears & Speed Reducers • LimiTorque Valve Controls

Established 1892

Quality Speaks among the thousands of users of



THE THOMPSON GRINDER COMPANY, SPRINGFIELD, OHIO

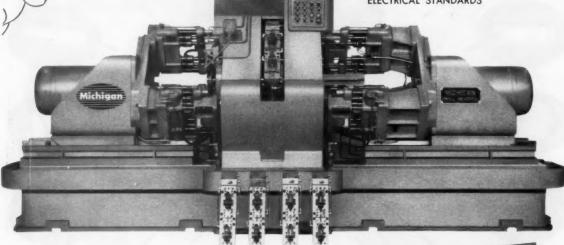
For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-51

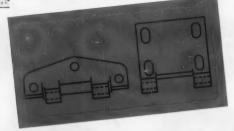


DRILLS and REAMS
AUTOMATICALLY
1800 AUTO DOOR
HINGES PER HOUR

BUILT TO J. I. C.
HYDRAULIC AND
ELECTRICAL STANDARDS



- Double end, 4-place, 4-station machine.
- Way type hydraulic feed.
- Feed ways hardened, ground, and automatically lubricated.
- Trunnion type fixtures power operated.
- Interchangeable fixtures for any kind and size hinge.
- Only a minimum amount of tooling required for model changeovers.



For Faster, More Economical Production

We also invite your inquiries regarding our full line of tapping units, and index tables, manual and automatic.



DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment

NOW- FOR THE FIRST TIME EVER...

Laminated Shims of STAINLESS STEEZ



Only in LAMINUM® can you get the unique qualities of stainless steel combined with the advantages of surface-bonded laminated shims.

Material is tough, corrosion-resistant Type 302 Stainless Steel (min. 95,000 psi). Laminations are either 0.002" or 0.003", and they simply p-e-e-l for time-saving adjustment to give you a "thousandth" fit right at the job. No machining. No grinding. No miking. And no dirt between layers!

Stainless Steel LAMINUM® Shims are custom-cut to any shape from any of our standard thicknesses; write for stainless steel specifications.



Send us your blueprints and quantity requirements for a quotation; there's no obligation.

SHIM HEADQUARTERS SINCE 1913

3901 UNION STREET, GLENBROOK, CONNECTICUT

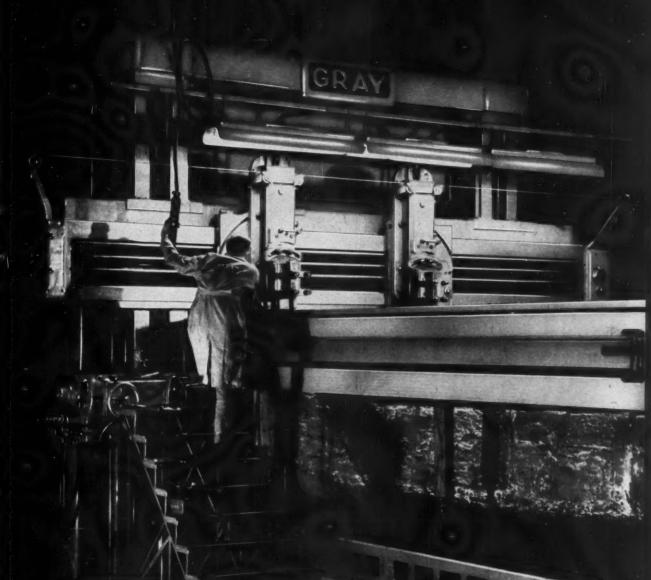




Seals are available from American in plain felt, or laminated with one or more layers of impervious, oil-proof Hycar. Tell us what you want a seal to do and we will show you the seal that should do it.



GENERAL OFFICES: 38 GLENVILLE ROAD, GLENVILLE, CONN.
SALES OFFICES: New York, Boston, Chicago, Detroit, Cleveland, Rochester, Philadelphia, St. Louis, Atlanto, Dollas, San Froncisco, Los Angeles, Portland, Seattle, Montreal.—PLANTS: Glenville, Conn.; Franklin, Moss.; Newburgh, N. Y.; Detroit, Mich.; Westerly, R. I.—ENGINEERING AND RESEARCH LABORATORIS: Glenville, Conn.



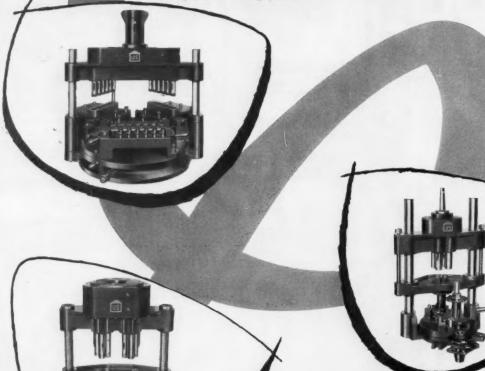
BIG boy

Big planers are usually slow planers. But not a GRAY! Carbide cutting speeds backed by tremendous power assure you that big planer jobs don't grow old on a Gray. All GRAY planers from king-size Giants to eager Cubs are built for high production. They have more original engineering developments and features than any other planer. They are in such demand that GRAY is the largest planer builder, further proof that Quality doesn't cost . . . it pays.

The G. A. GRAY Co., Cincinnati, Ohio

DRILL HEADS, FIXTURES and BUSHING PLATES AS A COMPLETE PACKAGE

The 12-spindle unit shown below has a three-station hand-indexing table with three holding fixtures, complete with tool guide bushing plates.



Shown above is a drill head complete with boring bars with Carboloy-tipped cutters and Stellite wear strips. The indexing table has necessary holding fixtures with bushing guide plate.

The setup, left, has a two-position, hand-indexed fixture.

Write for details on any type of universal joint adjustable head. Ask also about our totally enclosed gear-driven adjustable, fixed center, or individual lead screw tapping heads.

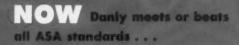
UNITED STATES DRILL HEAD COMPANY

616-618 BURNS STREET

CINCINNATI 4, OHIO

ALW design freedom

PEATURED IN THE EXPANDED DANLY DIE SET LINE



with the world's broadest die set line. There's no need for compromise between the standard set you want and the set you can get, less need for costly specials. The new line of Danly Standard Die Sets has die space and guide post dimensions that equal, or exceed, ASA specifications. Under the new standards, front to back die space is measured from edge of bushing to front of die set.

In addition to offering a complete selection of ASA standard die sets, Danly provides the Danly Standards proved popular over the years ... all available from stock at your nearest Danly Branch You can be sure of meeting all your die set needs at Danly ... either ASA standard or Danly Standard.

NOW Danly offers you these additional features



Off Labrication System For Shoulder Seshing Sate. This now Danry die set feature assures longer life, sasier maintenance, proper lubrication even further long runs.



All Harizannal Surfaces Sreams On New Death Die Sets, Horizonsal surfaces, including top of punch holder and bottom of die holder, are ground to the same exacting precision as the inner die set



lategral Wester Ibanks, 100% seid on sit steel sets regularly furnished with shanks gives greater strength and ngicity. Deep counterbores in punch holder have less tendency to weaken set.



DIE SETS AND DIEMAKERS' SUPPLIES DANLY MACHINE BPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50. Illinois.

STANOIL Industrial Oil delivers on tough assignment at Indianapolis Screw Products Corp.

Rolling threads on aluminum bronze with pitch diameter tolerances as close as .0014" is a tough job but Indianapolis Screw Products Corporation is used to taking on such jobs and delivering. They give tough jobs to the hydraulic oil they use, too, and they expect it to deliver. They've given such a job to Stanoll and they're getting the results they expect—and more.

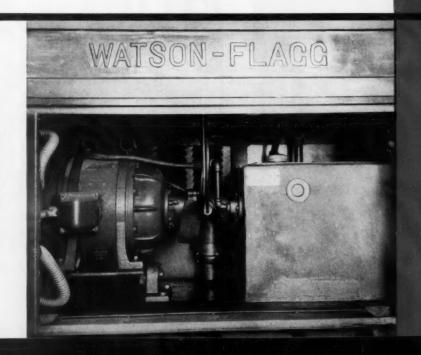
stanoil Industrial Oil is used in the hydraulic system of a Watson-Flagg precision thread roller in the Indianapolis Screw Products Corporation plant. The system uses a Vickers pump and Cuno filter. The filter has not been cleaned in over a year because it hasn't

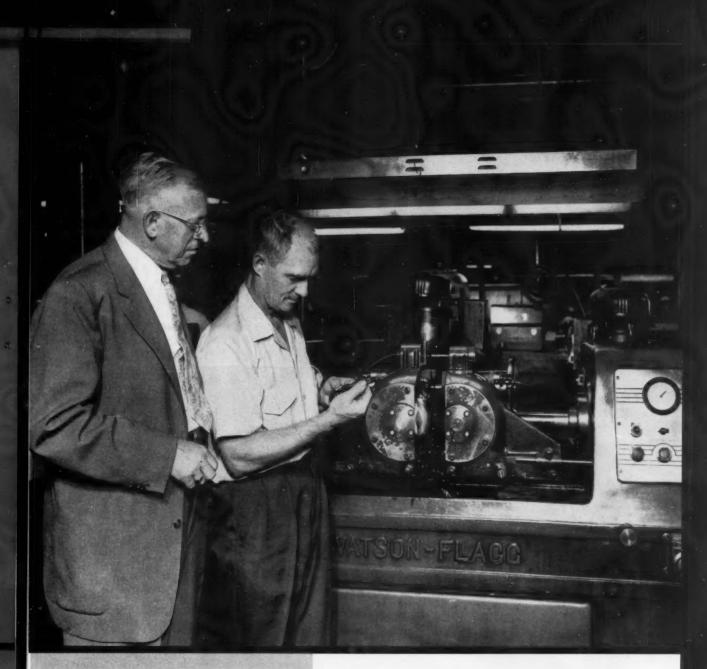
needed cleaning. Here, as in other applications, STANOIL delivers top performance with minimum maintenance and maximum system cleanliness.

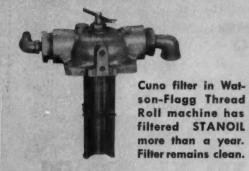
STANOIL likes tough assignments like this one; likes them because it can deliver with plenty to spare.

Perhaps you would like to know about the use of Stanoil in a hydraulic application in your plant. In the Midwest and Rocky Mountain states, a lubrication specialist at your nearby Standard Oil office will be happy to discuss it with you. Call him. Or, if you would like, contact Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Tight gaskets, good maintenance, and STANOIL add up to first rate performance at Indianapolis Screw Products Corporation. This shot of Vickers pump shows how good housekeeping and STANOIL team for top operation on tough assignment.







STANDARD OIL COMPANY

(Indiana)

Mr. R. W. Williams, Plant Superintendent, checks pitch diameter of thread with Glenn Riggs, Standard lubrication specialist. Glenn Riggs is an old hand at helping industrial firms work out lubrication problems. Glenn has been doing this sort of thing for 28 of the 30 years he's

been with Standard. This background and experience, customers have found, pay off for them.



to cut machining costs

machine faster with

Continuous Broaching



Higher machining production than ever achieved by any other method has been made possible in many cases through the use of the Footburt Continuous Surface Broaching Machines. In most cases, production is limited only by the speed at which parts can be loaded into the self-clamping fixture. Unloading is automatic. If you have a problem of high production on small parts, send blueprints and hourly requirements.

THE FOOTE-BURT COMPANY

Cleveland 8, Ohio
Detroit Office: General Motors Building

Hengineered for production

FOOTBURT

PIONEERS IN SURFACE BROACHING

60-MACHINERY, January, 1956

SINGLE SPINDLE DEEP HOLE DRILL

Handles Hole Depths of 6" to 11" at Various Angles This BAUSH Single Way
Angular Mechanical Leadscrew Unit,
with an 18" stroke, is exceptionally versatile,
fast, and accurate

Designed for a large aircraft engine builder who required extreme accuracy rather than high production, its single spindle carries a ½" drill set at a 5° angle to prevent the refrigerated coolant from flowing into drive unit. A special refrigerating unit at right of illustration holds coolant to proper degree of coolness.

1/4" drill runs at 225 surface feet, or 3500 RPM, with a feed rate of 4.2" per minute. Refrigerated coolant, under pressure, passes through head and spindle to cutting tip of drill.

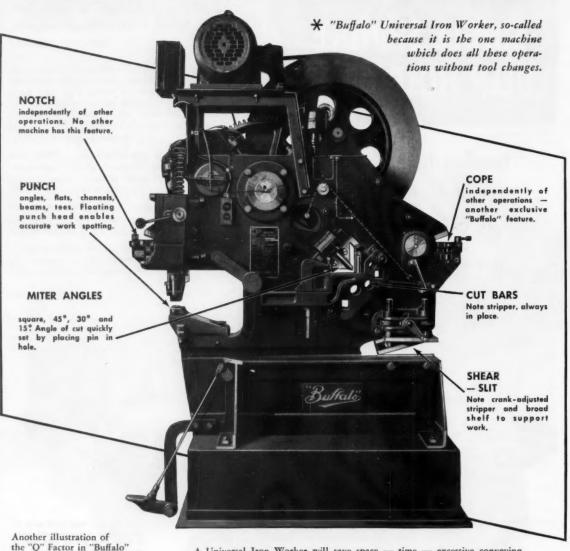
Rotary table setup takes 3 different part fixtures — with part holes ranging from 6" to 11" deep and running at various angles.

Air-operated sliding bracket, with outboard guide for tools, connects to limit switch to automatically and accurately control hole depths.

> Probably you too have need of such special machine tools. Send us your part prints and tell us your problems — there's no obligation.

BAUSH MACHINE TOOL CO. SPRINGFIELD 7, MASSACHUSETTS

YOU CAN DO MORE JOBS IN LESS TIME - WITH A U.I.W.



the "Q" Factor in "Buffalo" machines—the built-in Quality which provides trouble-free satisfaction and long life.

A Universal Iron Worker will save space — time — excessive conveying of work from machine to machine in your shop — because it does so many jobs. Often called the "most useful machine in the shop". For complete details, write for Bulletin 360.



BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. DRILLING

SHEARING

BENDING



the tooling shown.

Amount and position of crown for any specific work unit is optional.

The Plunge-Cut Process is equally applicable to straight-tooth gears and with the same economy in shaving time.



TYPICAL CROWN-SHAVED TOOTH CONTACT AREA



If you are mass-producing internal gears, write for Bulletin S55-6 on Internal Gear Shaving Machine, Model GCR

NATIONAL BROACH AND MACHINE CO.

. DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT



Sulphur Staining on Ferrous Parts is Harmless

Staining of machined ferrous parts caused by cutting fluids containing active sulphur is similar to the stains you find on your silverware. It has no adverse effects whatsoever on the finish, or characteristics of the metal. It is not corrosion, and according to automotive and military authorities, in no way affects service life.

Experience has proved that cutting fluids containing active sulphur provide far better performance when machining the tougher steels. Staining can only occur during very humid conditions or when water is allowed to contaminate the sulphurized cutting oil. A sample piece of metal will not stain in a cutting fluid free of water... but often it will the moment moisture is added.

The *important* factors to consider when selecting a cutting fluid are surface finish, production and tool life. Here is where

a cutting fluid pays for itself. Ask to have "the Man in the Barrel", your Stuart Representative, help select that Stuart Oil that will produce the very best results under the conditions you will subject it to.

Further information on sulphur staining is provided in the D. A. Stuart Shop Note Book, Bulletin S-1. Write for your copy.

D.A. STUART OIL COMPANY, LTD. 2739 S. Troy St., Chicago 23, III.

More than a "Coolant" is Needed

Plants in: Chicago, Detroit, Cleveland, Hartford, and Toronto, Ontario.

Branch Warehouses and Representatives in principal metal working centers in the United States, Canada and Europe.



Stuart Nils

Time Tested Cutting Fluids and Lubricants

JUST LIKE PUTTING MONEY IN YOUR POCKET

When you use R and L TOOLS on your Automatic Screw Machines and Turret Lathes you cut costs and increase production!

These facts are attested by the tremendous amount of repeat orders we receive for R and L TOOLS . . . Satisfied customers ordering more and more of these tools, for they like their quality — guaranteed not to bend or give way . . . They like the precision work which can be performed with R and L TOOLS . . . And best of all, they like the money R and L TOOLS save them!

Have you tried R and L TOOLS? . . . Once you do, you'll never be satisfied with any others . . . And until you do, you are actually losing money!

Rand TOOLS

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES) • UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL



You save on ...

• LESS SET-UP TIME

- . GREATER PRODUCTION
- . LONGER LIFE
- . GREATER PRECISION

Write for new catalog

R and L TOOLS 1825 BRISTOL ST. PHILADELPHIA 40, PA.

- Please send me your new catalog
- Please arrange for no-obligation demonstration of R and L TOOLS

NAME

COMPAN

ADDRESS

No line of Dial Snap Gages offers so much!

Paralloc Dial Snap Gages, available in types "D" and "L", feature large square anvils (tungsten carbide faced) which are flat and parallel. The D-TYPE, available in eight sizes up to 8 inches, is a truly modern general purpose design, embodying many unusual features including an adjustable plunger tension. The L-TYPE, available in sizes up to 14 inches, which has a 100% shockproof movement actuated by the lower anvil, is designed for the toughest of long run jobs.

Light in weight, rugged in construction, Paralloc Dial Snap Gages are designed to withstand severe usage. The Paralloc pin locking mechanism preserves the parallelism of the anvil faces throughout the adjustment range to an exceptional degree of accuracy.

NEWH Dializer SF SERIES

Here is a new line of lightweight, long range Dial Snap Gages which feature low cost precision. Nine sizes up to 13½ inches. Upper anvil is spherical, lower anvil is flat; both anvils are faced with tungsten carbide. Settings are easily accomplished with a fine adjustment screw. Other features include provision for rotating the indicator and an adjustable contact pressure. Wide choice of indicator sizes and graduations.

Dializers®

Here is the ultimate in economy: Any make of Adjustable Limit Snap Gage conforming to American Gage Design specifications becomes a modern dial snap gage when equipped with STANDARD's Dializer.

> Write for details and prices to meet your specific needs.

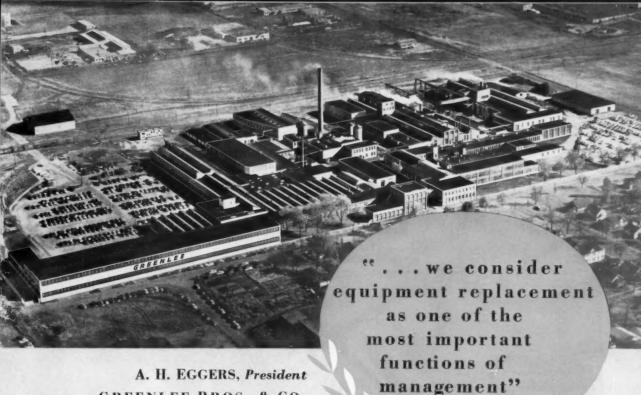
STANDARD

62 PARKER AVENUE

COMPANY,

POUGHKEEPSIE, N.Y.





GREENLEE BROS. & CO.

suggestions regarding the disposition of present. equipment. A list is then compiled and checked with the division superintendents who, as a rule, have already given close consideration to the items concerning their own division.

"This procedure is followed through to its logical conclusion by way of conferences, meetings with manufacturers' representatives, and the final decision by the president. While the process is not as formalized as in some companies, computations are made to determine priorities, advantages of new over old, and the long-run requirements and profit possibilities.

"We know that modern equipment, properly used, is the most important key to profits. And since profitable operation is necessary for full employment and future expansion, we consider equipment replacement as one of the most important functions of management".

"Since Greenlee manufactures a great variety of tools and machines, ranging from auger bits to large transfer and other types of special precision metalworking machines for the mass-production industries, we find it imperative that close attention be paid to equipment selection, replacement, maintenance, and use. In other words, we find it necessary to follow the advice that we offer to many of our customers with reference to the use of up-to-date equipment.

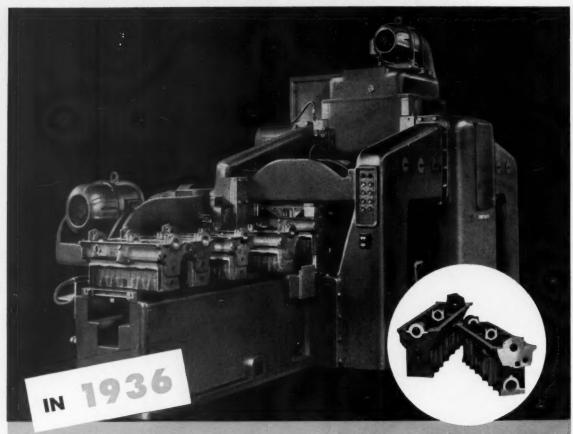
"Here at Greenlee, equipment replacement and the consideration of additional equipment for expanding output is a continuing program. It requires the close cooperation of the master mechanic with shop supervisors, division superintendents, and top-level management.

"Throughout the year a canvass of supervisors is made to determine the machines to be considered for replacement, to get ideas as to what equipment should be purchased, and to obtain

Rockford Insert Group

January, 1956

Keep gathering metal working production
working production
ideas...be well informed
when you replace machinery



SUNDSTRAND DELIVERED THIS TRANSFER TYPE MACHINE AND IN A 7 YEAR PERIOD IT:

- Automatically milled 16 surfaces each machine cycle
- Saved \$249,984.00 per year in addition to increasing tool life
- Produced 8,750,000 cylinder blocks in 7 years
- Replaced 18 special milling machines
- Eliminated "Operator's fatigue"

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



"Engineered"

Production

Service*

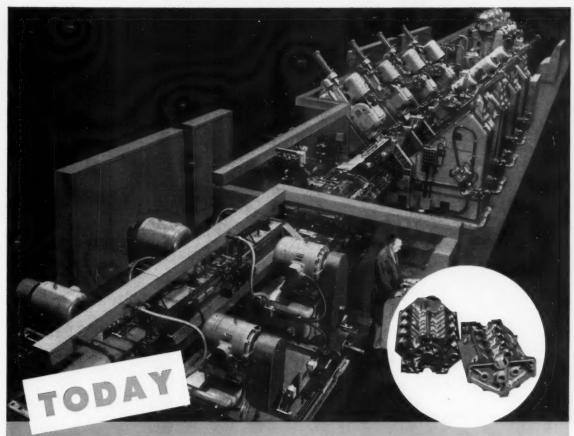








Machinery, January, 1956



THIS SUNDSTRAND TRANSFER
TYPE MACHINE:

is performing similar operations automatically with comparable present-day savings.

SUNDSTRAND has pioneered in other progressive

machine tool designs .

For Instance, most recent is the punch card controlled automatic lathe for turning shafts automatically. In the field of machine tools there are also progressive milling and turning machines and designs for accessory equipment. Get all of the facts. Write for a complete set of bulletins today. Ask for Set No. 663.



SPECIAL MACHINES

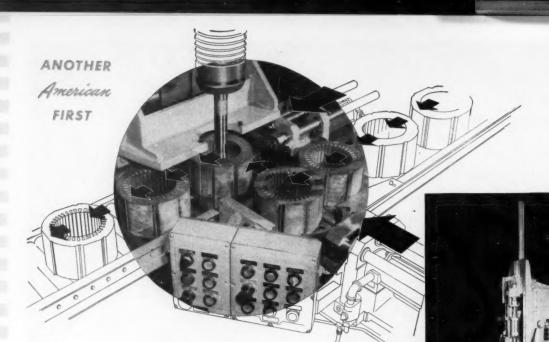




SUNDSTRAND Machine Tool Co.

2530 Eleventh St. . Rockford, III., U.S.A.





... completely AUTOMATED BROACHING

STATOR PARTS BROACHED IN 20 SECONDS



Installed in a conveyor line, this American 3-way broaching machine with a hydraulic broach retriever and electrical controls, broaches the L.D. of stator parts in a 20 second cycle. Parts coming into the machine are automatically shuttled into position, broached, and then discharged back on the conveyor line. Interchangeable broach arbors and broach shells make it possible to broach several different parts of similar size.

FOR AUTOMATED OR INDIVIDUAL BROACHING PROBLEMS

SEE American

A merican approaches each broaching problem as part of the complete production cycle. Broaches, fixtures and machines—all designed and built by American—provide a complete broaching service. Let American help you cut your production costs. Send part print or sample to get the solution to your broaching problem. Ask for Catalog No. 450.

BEVEL GEAR BLANKS BROACHED IN 15 SECONDS



Using tooling similar to that illustrated, an American (PD) pull-down machine, installed in a conveyor line, automatically broaches the I.D. of a bevel gear blank in 15 seconds. By using interchangeable broach arbors and broach shells, over 20 similar bevel gear blanks are broached with this set-up.

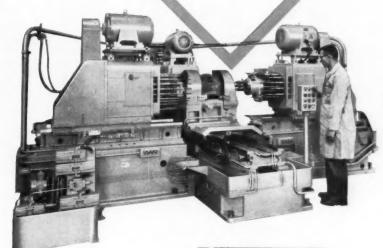
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

American Building - Ann Arbor, Michigan

See American First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



65 Holes Drilled and Tapped
In single Rapid
Approach-Feed
cycle





BARNESDRIL 3-way, 3-position UNIT MACHINE

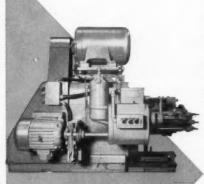
guarantees controlled production rate

This production-unit combination indicates the versatility of Unit-machining in drilling and tapping. 65 holes are drilled and tapped on 3 different planes — all in the same single rapid approach-feed cycle.

Two of the three production units grouped around this common base have lead screw tapping units mounted on the same slide. When the cycle starts, the production drill-unit rapid approaches and feeds. The tapping unit simultaneously rapid approaches to a positive stop, and lead-screw taps while the drill feed is operating. At completion of the cut the combined units rapid return for index. The third unit is strictly a drilling unit, and operates in cycle with the other two. Drill spindles are slip-type construction for job-lot flexibility.

Production averages 16 transmission housings per hour at 80% efficiency, and parts are completely drilled and tapped in one single operation.

This is a typical example of applied BarnesdriL engineering experience in combining a wide range of production operations into the shortest possible production time. Drop in at our Booth at the Machine Tool Show and talk over controlled production rates for your shop.



View Showing Lead-Screw Tapping Unit Mounted on the Side of Production Drill Unit.



BARNES DRILL CO.

820 Chestnut Street . Rockford, Illinois

Machinery, January, 1956

The same

20

hydraulic planers

equipped with Kopy-Kat duplicators

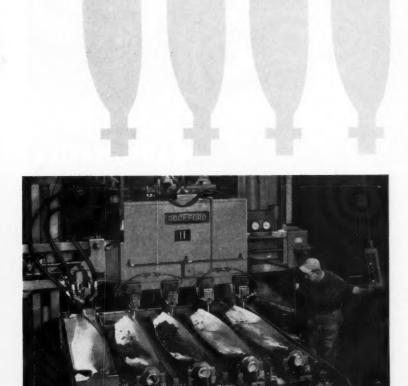
mass-duplicate airfoil

for propeller blades



ROCKFORD MACHINE TOOL CO.





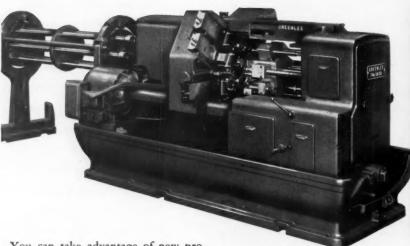
Here's another example of Hydraulic Planers at work. This battery of twenty Hydraulic Planers, equipped with Kopy-Kats, machines propeller blades. The machine shown in the closeup is finishing four blades simultaneously from one master. The inherent advantages of Hydraulic drive make this gigantic installation an extremely powerful production unit. Hydraulic Drive is a natural for reciprocating machine tools. It's being proven daily in the world's finest machine shops. Ask a Rockford Machine Tool Co. representative for the facts on modern Hydraulic Shapers, Planers, Slotters, Shaper-Planers and Kopy-Kats.

2500 KISHWAUKEE STREET · ROCKFORD, ILLINOIS

Hy-Draulic



greater accuracy, faster production



WITH
GREENLEE
SIXSPINDLE
AUTOMATICS

You can take advantage of new production techniques...attain higher levels of efficiency with the improved Greenlee 6-Spindle Bar Automatic. Its advanced design opens the door to some real profit opportunities. • These design improvements are fully described in a catalog recently issued. Let us send you a copy today. Find out how Greenlee Automatics can save time and money in your plant. It will pay you to investigate.

IMPROVED SPINDLE CONSTRUCTION

The spindle has been completely redesigned to assure greater accuracy at higher speeds. True running...the new Greenlee spindle has five widely spaced, preloaded, angular-contact, precision ball bearings. Entire spindle is dynamically balanced for smooth operation. Metallic seals, labyrinth and friction washers with line contact provide maximum heat dissipation.

INCREASED SPEED

Spindle speed range has been increased. Enables you to take full advantage of the top efficiency and peak performance which carbide and high-speed tooling offer. Reduces downtime losses and tool costs.



WRITE FOR CATALOG No. A405



GREENLEE BROS. & CO. 1861 Mason Avenue Rockford, Illinois



Machinery, January, 1956

CENTER OF MACHINE-TOOL EXCELLENCE ROCKFORD, ILLINOIS, U.S.A.



NEW MACHINE ROUTS and MILLS BIG ALUMINUM AIRCRAFT PARTS

This No. 410 CAV-RO-MIL Cavity Routing and Milling Machine is specially designed and built to meet the needs of today's—and tomorrow's—aircraft manufacturers. It has tremendous metal-removing capacity, speed, accuracy, versatility, and ease of operation. It will cut costs, improve quality, and increase production by substantial amounts. New concepts of construction, performance, and control have been developed, proved, and then incorporated into this amazing new machine tool. Write today for full details.

DUAL TABLE SET-UP

One leading aircraft firm uses the No. 410 CAV-RO-MIL in the arrangement shown above; employing dual control stations. The two tables are identical, and mounted on big concrete foundations. While one is being used, a set-up of a new template and work piece can be made on the other. The templates are clamped to the "ceiling" under the top canopies.







Accurate, smooth operation speeds production of difficult-to-grind precision parts



This plane angle is made of aluminum and ground to a 25 micro inch finish. It is typical of the close tolerance work done on this grinder.

Smooth operation that permits accurate grinding of oddly shaped, difficult-to-hold pieceparts is one of the greatest advantages in the use of a Mattison High-Powered Precision Surface Grinder, according to a Detroit manufacturer of surface plates, angles, and related products. Because these products are destined for layout operations, they must be made to precise tolerances. Mattison surface grinders have made it possible to maintain these tolerances along with cutting setup time in half, and increasing accuracy and production 50 per cent.

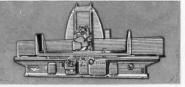
The part shown in the main illustra-

tion is a plane angle of Meehanite iron which must be ground to .0002 parallel in 60 in. removing .002 in. of stock on each pass. Finish required is 25 micro inch. This piece is difficult to grind because it is high and narrow and hard to hold on the table. The smooth operation of the Mattison grinder eliminates any possibility of vibration or tearing loose of the piece.

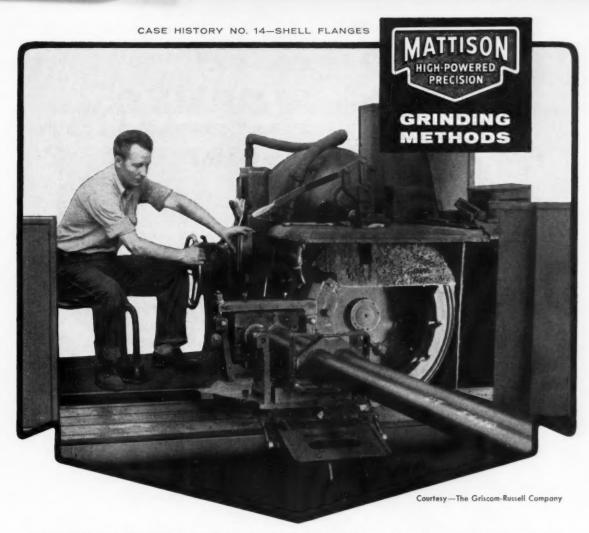
Every Mattison surface grinder fea-

Every Mattison surface grinder features the high horsepower and sturdy construction that are needed for smooth and accurate operation on this type of work, as well as a wide range of other grinding. Send for catalog today

THERE IS A MATTISON
TO GRIND IT







\$3500 saved yearly by grinding heat exchanger shell flanges on the Mattison No. 500

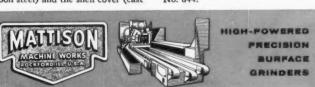
One Mattison No. 500 Traveling Wheel Grinder and one operator turn out 300 pieceparts per week (two shifts) on an operation that formerly required two boring mills and two operators in the plant of a producer of heat transfer equipment. Shell and flange gasket surfaces of a twin G-fin section are ground on this machine.

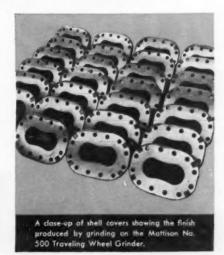
The twin G-fin section is a simple form of heat exchanger, consisting of an inner pipe which is the G-fin element and an outer pipe which serves as the shell.

To prevent leakage and secure a gasket-fit, the surface of the shell flange (carbon steel) and the shell cover (cast

or forged steel) both measuring approximately 9 x 12 in., are ground to a 65 to 70 micro inch finish. Stock removal is approximately .0625 in. Flatness is held to within .003 in. and the surface slightly roughened.

Mattison Traveling Wheel Grinders offer an excellent solution to the problem of grinding long and bulky pieces. The part, no matter how large, is clamped in a stationary position and the grinding wheel passes over the surface. Floor space required is only half that needed for a traveling table machine. Send for descriptive Bulletin No. 844.







need creative automation assistance?

investigate W. F. & JOHN BARNES TWO-FOLD AUTOMATION SERVICE

ENGINEERING COMPLETE PRODUCTION-LINE SYSTEMS

Complete service includes planning step-by-step sequence of operations and the individual engineering of processes, methods and equipment to meet your production needs. Barnes' creative engineering, developed over a period of 80 years in designing and building high production machine tools, can be depended upon to provide you with the latest in cost-cutting methods. Our highly versatile engineering staff will work with you as a team to solve problems quickly and efficiently.

DESIGNING AND BUILDING SPECIAL UNITS

To meet specific work-handling or processing needs, Barnes' engineers have designed and built special conveyors, turnover mechanisms, inspection, and assembling equipment to suit either automatic or semi-automatic requirements. Hundreds of units are today profitably serving a wide range of industries. Because electrical, hydraulic, mechanical, tool and fixture engineering is closely coordinated at Barnes under one roof, you save time and eliminate divided responsibility.

Ask for Production Analysis

Find out today why more and more production executives are turning to Barnes for help with their automation problems. Barnes' creative engineering staff will be pleased to analyze your requirements, offer recommendations, and provide you with a cost estimate in a formal proposal, if you desire.

Builders of Better Machines and Equipment since 1872



Write for Free Literature

AUTOMATION SECTION

415 S. WATER ST.

ROCKFORD, ILLINOIS

SPECIAL MULTIPLE SPINDLE MACHINE TOOLS . SPECIAL PROCESS EQUIPMENT . SPECIAL ELECTRICAL CONTROLS

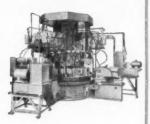






Memo From John S. Barnes Corporation

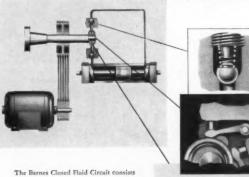
Here is the story of a new concept in hydraulic power transmission and control. Maintenance is simplified to cut costs substantially. Send for your copy today!



BARNES hydraulics in mass production INDUSTRY



BARNES closed fluid circuit and drive



The Barnes Closed Fluid Circuit consists of a rotary supporting means; a variable displacement pumping arrangement synchronously driven from the rotary means; and a driving arrangement, including means for connecting and disconnecting the rotation of the rotary means, which causes the displacement pump to operate automatically and synchronously with the rotary supporting means.







JOHN S. BARNES CORPORATION / ROCKFORD. ILLINOIS

a NEW automatic high-speed hobbing machine...



The Barber-Colman No. 3-6 Vertical Hobbing Machine is a single-purpose machine designed and built to meet the requirements of a specific job. The machine has standard basic elements, but the tooling, loading, gaging and handling are designed for maximum production of a specific part. Its high-speed operation makes it adaptable to all mass produced parts up to 3" diameter by 6" face width. Maximum pitch capacity is 10 DP. Hob speeds for carbide hobbing of non-ferrous and non-metallic blanks are available. Features which contribute to the high-speed operation of this machine include exceptionally large heat-treated and ground bed ways, short drives to the work and hob spindles, and a hardened and ground multiple-thread index worm.

RUILDERS OF PRECISION GEAR



No. 3-6

for high production gear cutting with automatic handling, loading and gaging

automatic loading

Blanks are automatically loaded from a vibratory hopper loading device. However, the type and variety of loading and handling devices with which this machine can be equipped are almost unlimited. Loading can be by magazine or conveyor when required.

automatic gaging

The gaging mechanism segregates gears of the correct size from those that are oversize or undersize. Size inspection is made by measuring over balls. If a pre-determined percentage of gears are out of tolerance, the machine can be made to stop automatically. The gaging unit can be furnished to inspect almost any elements of the gear.

automatic hob shifter

The automatic hob shifter can be set to shift a certain amount after each cycle, or it can be arranged to shift after a certain number of parts have been cut. Shifting increments can be changed easily by means of a graduated dial. The hob slide is clamped pneumatically.

centerdistance adjustment

The hob is set to the proper depth by means of a centerdistance adjusting mechanism, eliminating the usual time-consuming method of setting the hob to depth. The hob is placed in a fixture, and an indicator finger is set against the outside diameter. The indicator is calibrated to show the centerdistance between the work and the hab. This centerdistance setting is made by means of a graduated dial on the machine.

Some basic machine facts:

- Short, Compact Drives to Work and Hob Spindles
- Anti-Friction Work and Hob Spindle Bearings-Tapered Roller Type
- Pneumatic Work Clamping
- Self-Contained Lubrication and Coolant Supply
- Heat-Treated and Ground Bed V-Ways
- 2 HP, 1800 RPM Drive Motor
- Unitized Construction

HOBS . CUTTERS . REAMERS HOBBING MACHINES HOB SHARPENING MACHINES

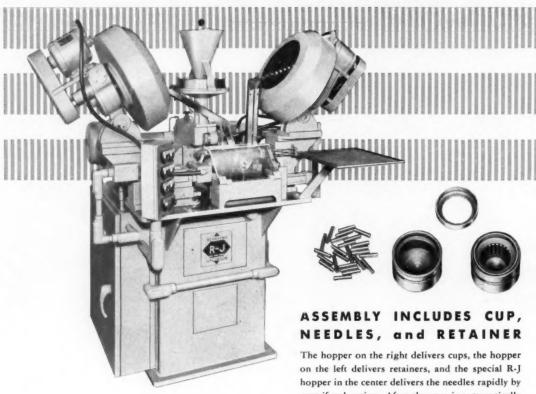


GENERAL OFFICES AND PLANT, 611 ROCK STREET, ROCKFORD, ILL.



Rehnberg-Jacobson

FULLY-AUTOMATIC MACHINE ASSEMBLES NEEDLE BEARINGS



25 YEARS OF EXPERIENCE

This machine, which is used to assemble bearings for the "cross" of a universal joint employed in a well-known automobile, represents another climax in the long and successful history of the design and manufacture of Needle Bearing Assembly Machines by Rehnberg-Jacobson. Much specialized knowledge and many unique and ingenieus mechanical devices go into the development of such a machine. Rehnberg-Jacobson has made a specialty of producing highly successful and economical machines of this nature for twenty-five years. We are prepared to quote on your needs.

The hopper on the right delivers cups, the hopper on the left delivers retainers, and the special R-J hopper in the center delivers the needles rapidly by centrifugal action. After the cup is automatically greased, the needles are projected into it, and a retainer is pressed in to hold them. Then the assembly is delivered, open side up, to the tray. The cup and retainer hoppers employ gravity and a balancing edge to insure that all parts delivered to the chutes are facing properly for assembly. Assembly and delivery actions are operated hydraulically. Capacity is 900 assemblies per hour, or more. All that is required of the operator is to keep the hoppers loaded and remove the filled trays.

Designers and Builders of Special Machinery

R-J

2135 KISHWAUKEE ST.

REHNBERG-JACOBSON MANUFACTURING COMPANY



Machinery, January, 1956

MACHINES DESIGNED TO MEET YOUR NEEDS ROCKFORD, ILLINOIS, U.S.A.



It's easy to prove the superiority of REX. Use it on the job...check its size, structure, response to heat treatment, fine tool performance. You'll agree with thousands of other users—you can't find a high speed steel to outperform REX.

Remember, REX is made only by Crucible. So call for REX at any Crucible warehouse, or for quick mill delivery. Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 30, Pa.

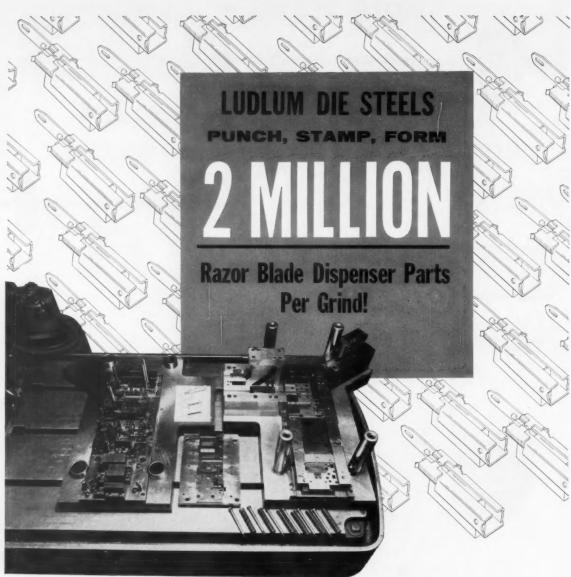
CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-83





DEWARD & ONTARIO
BLUE SHEETS

These 4-page folders contain complete information on forging, annealing, tempering, etc., and detailed laboratory data on physical characteristics of Ludlum Deward and Ontario. Ask for your free copy.

Address Dept. M-73

Punching, stamping and forming parts of this die are of air-hardening Ludlum ONTARIO—heat treated to 61-62 Rockwell C. Slides, frames and cams are of Ludlum DEWARD oil-hardening die steel—heat treated to 61-62 Rockwell C.

Ontario sections were pre-heated to 1250 F, then heated to 1850 F, held at 1850 F for about an hour and a half, then quenched in still air to room temperature. Finally they were drawn at 350 F for about three hours.

Deward sections (slides, frames and cams), were pre-heated to about 1200 F,

then raised to 1420 F. As soon as they were uniformly heated and equalized with the furnace temperature, they were quenched in warm oil. Sections were then tempered for two hours at 325 F.

Thus, two superior Ludlum steels combine to solve an intricate production problem. You, too, may have an application that will benefit from a better selection of tool or die steels. For complete information, call your nearest A-L distributor or representative today, or write Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh, Pennsylvania.

For complete MODERN Tooling, call Allegheny Ludlum





Want Fast Tool Steel Service?

SEE YOUR BETHLEHEM DISTRIBUTOR

Whether you want to order a quantity of tool steel, or merely a short bar, or just would like a bit of advice about the correct method of heattreatment, you're sure to find your Bethlehem tool steel distributor anxious to be of service.

Prompt service is your distributor's middle name. He makes it a point to know your city like a book —its background, its people, its industry. He knows what grades of steel you are most likely to need, and in what quantities. And so he keeps large stocks of Bethlehem tool steel on hand, in a virtually endless variety of types, all of them ready to go at a moment's notice.

If you would like bars cut to special length, or if there's a tricky

phase of metallurgy or some other tool-steel problem troubling you—again, your distributor is at your beck and call. He's a real friend. They don't come any better. It will pay you to get to know him.



Oakite's FREE **Booklet on Metal Cleaning**

WHAT'S THE FASTEST WAY TO CLEAN METAL? See page 11

WHAT'S THE MOST ECONOMICAL WAY?

See page 9

Some good things to know about Metal Cleaning OAKITE PRODUCTS, INC

answers many questions that mean better production, more profit for you. Just look at the table of contents:

Tank cleaning methods

Electrocleaning steel

Electrocleaning nonferrous metals

Pickling, deoxidizing, bright dipping

Applying iron phosphate coatings in preparation for painting

Applying zinc phosphate coatings

Cleaning, removing rust and conditioning for painting in one operation

Machine cleaning methods Paint stripping

Steam-detergent cleaning Barrel finishing, burnishing Better cleaning in hard water

Treating wash water in paint spray booths

Rust prevention

areas

Coolants and lubricants for machining and grinding

FREE Write today for a copy of this 44-page, illustrated booklet.

Export Division Cable Address: Oakite



OAKITE PRODUCTS, INC. 26 Rector St., New York 6, N. Y.

Send me, without obligation, a copy of your booklet: "Some good things to know about Metal Cleaning"

COMPANY.

ADDRESS.

You'll want to know the answers

Technical Service Representatives in Principal Cities of U. S. and Canada

Can one cleaning material do all metalcleaning jobs? See page 5.

What kind of cleaner attracts both oil and water? How does this help remove buffing compound residues and pigmented drawing compounds? See

Why clean ferrous and nonferrous metals in separate tanks? See page 10.

What are the advantages of reverse current for electrocleaning steel? See page 15.

For electrocleaning nonferrous metals, what are relative advantages of cathodic, cathodic-anodic and soak-anodic cleaning? See page 17.

Can you electroclean brass without tarnishing? See page 18.

How do bright dips make metals brighter? See page 21.

Can you clean steel and condition it for painting for less than 20 cents per 1,000 square feet? See page 24.

Would you like a cleaner that removes rust and oil at the same time; often eliminating all need for pickling? See page 28.

What's the best way to clean parts that are too large to be soaked in tanks or conveyed through washing machines? See page 30.

Does your burnishing barrel produce a luster you are proud of? See page 32.

What do you do when the overspray neither sinks nor floats in the wash water in your paint spray booth? See

Do you dry steel parts before anti-rusting? See page 37.





WHICH DIE STEEL WOULD YOU USE HERE to increase production from 100 to 23,000 parts?

Even after trying many different die steels, production averaged only about 100 pieces before this ring die had to be replaced.

The die cold forms cups as the first operation in producing rocket projectile noses from SAE 1010 Steel. Even though the ring die is press fitted into a four foot diameter hardened retainer ring (Rc. 34/36), the 1700 tons of pressure exerted in power extrusion prematurely stretches the die. The 12 lb. 2 oz. cups must be held within .2 of a lb. and wall thickness within .010".

Which die steel would you specify in a move to cut replacement costs and improve production?

From our customer Field Report files, here's how the toolroom solved the problem. The Carpenter Matched Set Method showed that Carpenter VEGA (Air-Tough) Die Steel was a natural for the job. Latest report shows that the VEGA ring die had increased production from 100 to 23,000 cups, and is still banging them out.

What better guarantee of success can you find for your own jobs than the word of hundreds of toolroom men who rely on Carpenter. Why settle for "ordinary" results when Carpenter is ready to help you explore the possibility for improvement? Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor now. The Carpenter Steel Co., 105 W. Bern St., Reading, Pa.

How can your toolroom use Carpenter Matched Tool and Die Steels to:



Reduce hardening hazards Minimize machine downtime Boost output per grind Improve product quality

Carpenter | |



Matched Tool and Die Steels

An exclusive GRINDING PROCESS...

makes

CUMBERLAND STEEL BARS

concentric, straight, smooth & really accurate



BE SURE OF THIS MARK ON THE END OF YOUR SHAFTS

CUMBERLAND GROUND BARS FOR ALL TYPES OF MACHINES

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired. And, remember, Cumberland Steel Bars are the end result of 109 years' experience,—and every bar is carefully tested before shipment. The list of Cumberland's customers reads like the "Blue Book" of Industry. Ask for further information.

MANUFACTURED IN THREE SPECIFICATIONS

Cumberland Brand—AISI C-1020/C-1025, Elastic Limit 30,000# Min.
Potomac Brand—AISI C-1040, Elastic Limit 45,000# Min.
Cumsco Brand—AISI C-1141, Elastic Limit 57,000# Min.

CUMBERLAND STEEL COMPANY

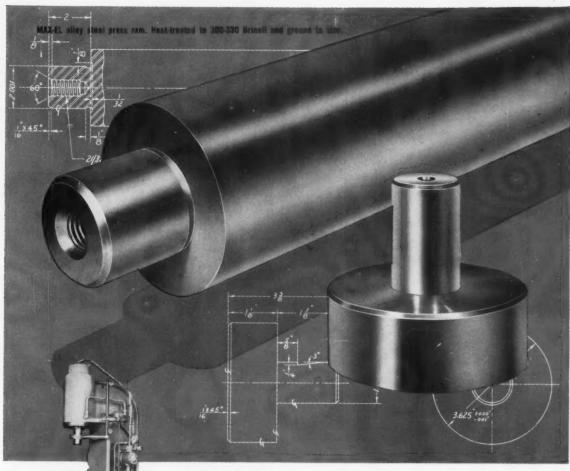
CUMBERLAND, MARYLAND, U.S.A.

ESTABLISHED 1845

INCORPORATED 1892

88-MACHINERY, January, 1956

For more information fill in page number on Inquiry Card, on page 221



MAX-EL Alloy Steel means no distortion—longer wear in 15-ton hydraulic press ram

To keep this 15-ton press operating day after day for years of dependable service, takes *special* steels. For example, even after thousands of cycles of operation, the ram *must* remain accurately in line with the work table. It demands a steel that will not distort, set or wear.

That's why both the ram and ram-plug are made of Crucible MAX-EL alloy steel. In fact, the manufacturer, Greenerd Arbor Press Co., Nashua, N. H., has been a steady user of MAX-EL for many years.

Here's what they have to say—"We have tried many grades of steel, but we find that MAX-EL 3½ heattreated in the bar works out better for our application."

And it probably will for yours, too. So when you have a job calling for a non-deforming alloy steel—one with excellent machinability, high-strength and wear-resistance—try Crucible MAX-EL. It's promptly available from your nearby Crucible warehouse, in the sizes and grades you need. Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.



Write for your free copy of this Crucible Publication Catalog listing dozens of helpful booklets and data sheets.

CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-89



He's shooting for perfection

This earnest young man is intent on turning out a perfect sheave. From the looks of the job, we'd say his chances are fine. Best-looking sheave wheel we've seen in quite a while.

He has done his machining with great care, and with complete confidence. That confidence is warranted, for the wheel was first a Bethlehem steel blank, made by Bethlehem's forging-and-rolling process.

If you've never seen this method of manufacture, let us explain it briefly. It employs a mill that is the only one of its kind in the entire country. Blanks are not just forged, not just rolled, but *both*—in a single operation that produces high strength and very desirable grain flow.

That high strength is important. Equally important is the

way the blanks machine. In the customer's shop, machinists can do their job with assurance, knowing that the metal underneath is as firm and "sweet" as that on top.

Bethlehem forged-and-rolled blanks are available for a long list of applications, including spur, bevel, miter, and other types of gears; crane and sheave wheels; turbine rotors, clutch drums, brake drums, flywheels, pipe flanges, and numerous others. You can obtain the blanks in sizes from 10 to 42 in. OD, untreated or heat-treated. For full details, ask for Booklet 216; it will be sent to you promptly.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast
Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL



Never before such an assemblage! 28,351* cost-cutting All in one building production-boosting All on one floor ideas and products See the 487 most useful and important tooling developments - one to each exhibit . . . They are the cream of more than 28,000 outstanding manuincluding. facturing products and processes to be shown. (*by actual report of exhibitors) at the 1956 ASTE INDUSTRIAL EXPOSIT International Amphitheatre sponsored by Chicago, Illinois • March 19-23 AMERICAN SOCIETY TOOL ENGINEERS

Never before...

Such complete all-industry conferences on advancements in tooling and production methods held anywhere in the world! Of vital interest . . . presented by leading experts in research and development who will be available for questions about your own operations . . .

- Ceramic Cutting Tools?
- Working the Wonder Materials
- What's New in Grinding?
- Diamond Symposlum-(latest information on the use of diamonds in industry . . . actual diamond workshop in action, co-sponsored by Armour Research Foundation)
- Automating the Individual Machine
- Machine Tool Economics—Rent or Buy?
- Plastic Tooling
- Tooling the World's Largest Presses
- Tool Engineering Research in Action
- Solving Carbide Die Problems (co-sponsored by National Tool and Die **Manufacturers Association**)
- Economical Production of Fine Pitch Gears
- Electronic Calculators and the Tool Engineer
- Automation Tolerances Affect Jig and **Fixture Design**
- The What and How of Surface Finish
- Automation—You Can Afford It!
- Fluid Power (National Fluid Power Assoc. co-sponsor)
- Metal Cutting Research Applied
- Training and Development of Tool Engineers
- Cost Reduction Through Product and Tool **Maintenance Analysis**
- Lubrication for the Tool Engineer
- · Standards and the Tool Engineer
- Professional Engineering

today.

Advanced Techniques of Cold Metal

Not again ...

-for two years will you be able

to attend such top level conferences

and at the same time

to inspect 28,351 products such as these

(many never before shown anywhere)

Abrasive Bands Abrasive Cut-off Machine Abrasive Discs Abrasive Stones Abrasive Wheels Abrasives

Abrasives, Cloth and Par Absorbers, Shock and V Accounting Machines Adaptors, Air or Rivet (Adaptors for Machine T Accumulators Adaptors, Boring Bar Adaptors, Milling Cutt Adaptors, SAE Pipe Th Adaptors, Tap & Drill Adding Machines

Adhesives and Cement Air Compressors Air Cylinders

Vibrating Machines Vises, Air Operated Vises, Bench Vises, Hydraulic Vises, Machine Table Vises, Magnetic Vises, Toolmakers

Washers Washers, "C" Type Washers, Spherical Water Conditioners, Spray Booth Wear Strips Wedges, Work Clamping Weighing Machines Welders, Arc Welders, Butt Welding Accessories & Controls Welding Electrodes

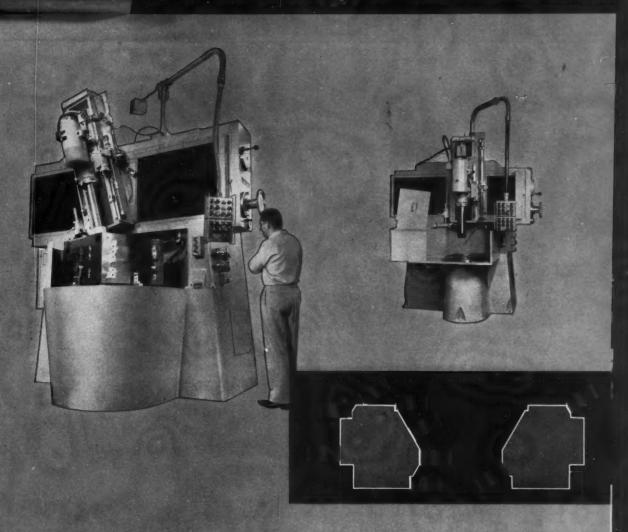
These samples and many thousands more to be presented by more than 480 exhibitors . . .

. . . BLUE RIBBON TOOLING CHAMPIONS

at the

1956 ASTE INDUSTRIAL EXPOSITION 24th ANNUAL CONVENTION TOOL ENGINEERS DETROIT 38, MICHIGAN AMERICAN SOCIETY OF complete information (CHICAGO, MARCH 19-23)

10700 PURITAN



one setup: nine jobs

As flexible, as responsive as a dentist's drill, a Springfield Vertical Universal Grinder can reach around and into a workpiece to do nine different jobs on one chucking.

If you make a pipeline valve, a mold, a bearing race—requiring micro-inch finish on any or all the faces shown in the diagram—at whatever angle—look into Springfield. These grinders cut down the number of set-ups, frequently eliminate hand-lapping, operate with fewer work-holding devices. And, as a bonus, on jobs calling for extreme concentricity, one angle setting of the Springfield head grinds both faces of mating parts.

All three models readily adaptable to special problems.

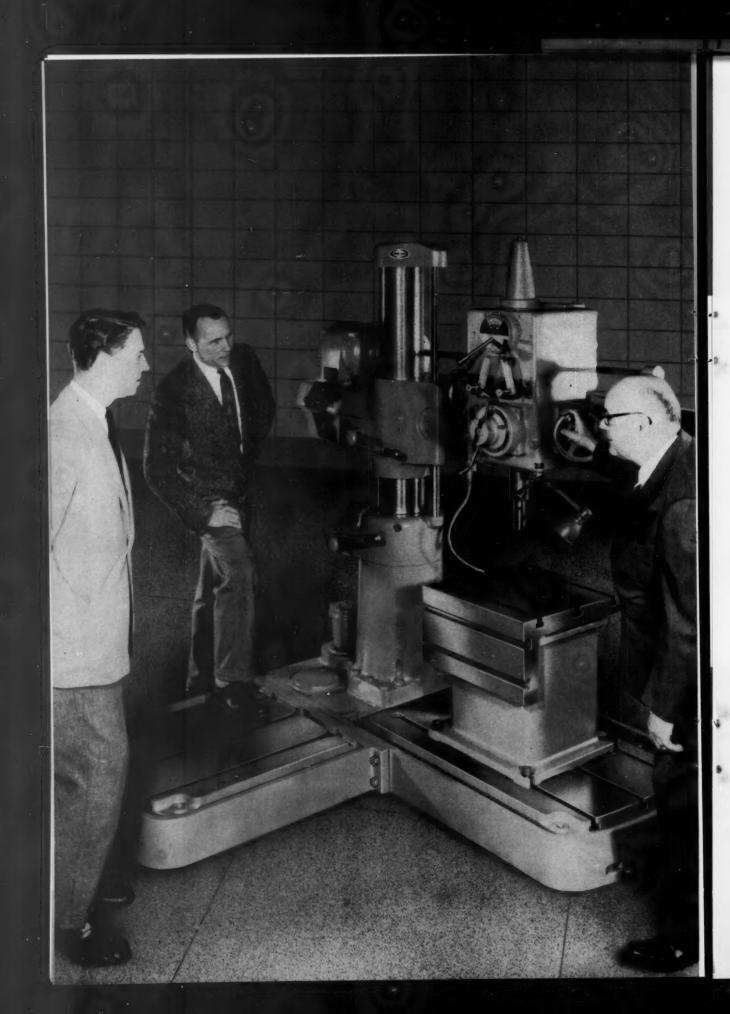
Vertical Universal Grinders: swings 18", 24" and 42".

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".

The Springfield Machine Tool Company Springfield, Ohio

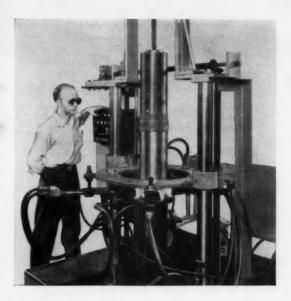
68TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

Sistematic Control



Easy to operate. Controls for 9 spindle speeds, 6 power feeds grouped conveniently for the operator. Simple color-matched speed and feed selection dials. No. 3 Morse taper spindle; 1¼" capacity in cast iron. Unit construction throughout; hardened steel gears; forced-spray lubrication.

Flame-hardened column. 7½" FLAMATIC hardened column provides a rigid cylindrical way for the 3' arm. Column is mounted on heavy-duty, antifriction roller bearings in a sturdy column support. Waffle-ribbed base of adequate floor area and weight to provide stability.





NEW LOW-COST CINCINNATI RADIAL DRILL RETAINS BUILT-IN ACCURACIES

FIRST WITH A HARD CLAD COLUMN

Researched—in the company's laboratories. Problem: how to retain built-in accuracies and prevent column scoring.

Engineered—to provide a thick-walled, centrifugal casting of close-grained iron; accurately turned on modern, high-speed lathes; surface hardened; then ground to close tolerances and a mirror-like finish.

Tested — by subjecting the new column to years of round-the-clock operation.

Approved—by the men who know machine tools best—the users.

Priced — attractively for contract and job shops, toolroom and maintenance use, and manufacturing plants.

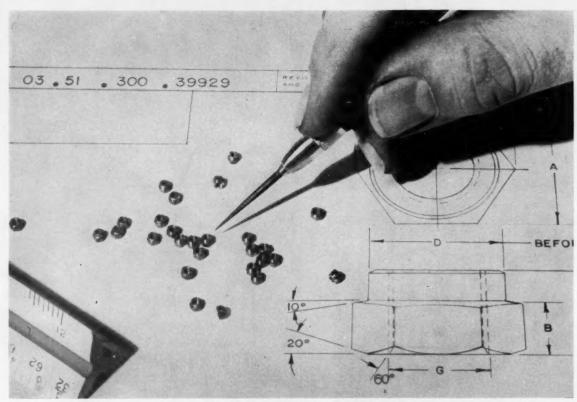
Available — now from CL&TCO authorized machine tool dealers in all major centers. Write to Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio, for catalog D-133 and name of nearby dealer.

LOOK FOR THIS TRADEMARK



CINCINNATI LATHE AND TOOL CO.





FLEXIOC Micro locknuts meet designers' needs for tiny precision nuts that retain strength and holding power in the smallest assemblies—servomechanisms, electronic and electrical equipment, all miniature devices.

Design Lighter, More Compact Products with New FLEXLOC Micro Nuts

Standard Miniature Locknuts Permit Design Engineers to Develop and Fasten Smaller Assemblies Safely

SIZE	Across Flats		Shoulder Height		Across Corners	Height
	MAX.	MIN.	MAX.	MIN.	MIN.	003
0-80 NF-3B	.111	.107	.047	.042	.123	.075
1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120
					1	

STANDARD FLEXLOC Micros—in sizes ranging from 0-80 to 4-48—are available in brass (either plain or cadmium plated). Consult SPS for miniature nuts of other conventional materials.



New FLEXLOC Micro locknuts are smaller and lighter than regular FLEXLOCS of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss

in strength or convenience of assembly.

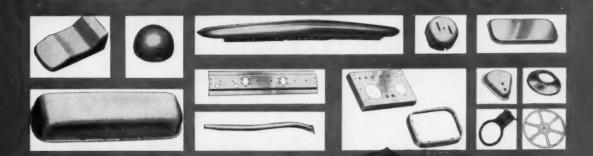
FLEXLOC Micros have all the advantages of larger FLEXLOCS. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil, temperatures to 250°F won't affect these Micro nuts. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on FLEXLOC Micro locknuts, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL Co., Jenkintown19.Pa

STANDARD PRESSED STEEL CO

FLEXLOC LOCKNUT DIVISION SPS

if you use or sell parts like these...



CLEARING O.B.I.'s help you

produce them more efficiently... sell them more profitably

Talk about diversification? It's nothing new.

Manufacturers of contract stampings have had it for years. They have to turn out all kinds of jobs.

For example, the Reliable Mfg. Co. in Franklin Park, Illinois produced the parts shown above on their four Clearing O.B.I.'s.

Reliable's Clearing inclinables range from 45 to 150 tons, giving this company the capacity to bid on a great variety of medium range jobs. Clearing dependability means Reliable can figure a job and know they're going to meet a tight schedule, know they're going to meet the price too.

If you make stampings like these, you'll find the efficiency of Clearing O.B.I.'s pays off in the clinches. Talk your problem over with a Clearing sales engineer.
Call us today.

Write for new Clearing beeklet—"Thinking about a better way to de the job."



Clearing C.S.I.'s turn cut a wide variety stampings at Reliable Mfg. Co.

CLEARING PRESSES

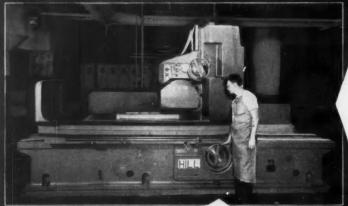
THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION division of U. S. INDUSTRIES, INC.

6400 West 65th Street, Chicago 30, Hitnels A Hamilton Plant, Hamilton, Ohio

What HILL GRINDERS Have Done for Others They Will Do for YOU!

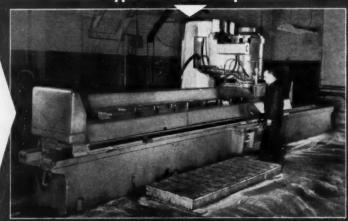
- Produce a smoother finish and closer tolerances.
- Increases man-hour production.
- Actual case histories prove definite worthwhile dollar savings over other methods



Use the "Hill" Horizontal Spindle Grinder for a wide range of grinding — flats, angles, irregular and special shaped surfaces — ideal for maintaining close tolerances with low micro inch finish. Made in table widths of 18", 24", 30" and 36" — table lengths from 5 to 20 feet.

- Built in both Horizontal Spindle and Vertical Spindle types.
- Choose the most efficient type for YOUR requirements.

Use the "Hill" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces — recommended for accuracy, speed and finish — features that mean increased precision production. Made in table widths of 18", 24" and 30" — table lengths from 5 to 20 feet.

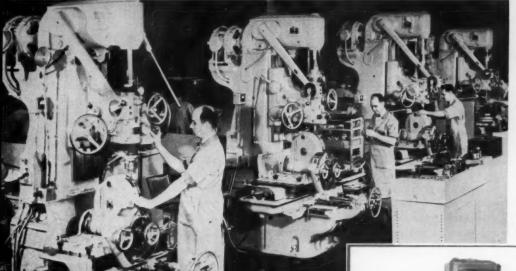




THE HILL ACME COMPANY

1209 WEST 65th STREET . . CLEVELAND 2, OHIO

"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES



A section of the Woodward Govsener Company plant in Rockford Illinois showing a line of four P&W No. 2A End-Measure Jie Borers equipped with P&W Precision Tilling Rotary Tables.

WOODWARD GOVERNOR COMPANY USES

PRATT & WHITNEY

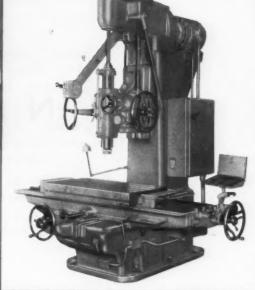
END-MEASURE JIG BORERS

". . . Pratt & Whitney was compared with other machine tools and found best suited to our needs."

Whether used for toolroom work or limited-run production, you'll find extreme accuracy, fast easy operation, dependability and low maintenance cost in P&W End-Measure Jig Borers.

The fundamentally correct P&W End-Measure System—basis for all others—uses precision end measures to obtain even inches and inside micrometers for inch fractions accurate to .0001"; every mechanic knows these instruments thoroughly. Built in "zero point" indicators provide a constant visual assurance of tenths accuracy.

The exclusive P&W Ball Roll Quill "roll feeds" on super-precision balls with a total pre-loaded bearing pressure of over 6000 pounds. This construction resists heavy lateral loads and retains initial high accuracy indefinitely without maintenance.



THE No. 2A-practical size for most shops; table 22" x 44"

also THE No. 1 1/2 B -compact and versatile; table 12" x 24"

THE No. 3B-large, powerful; table 24" x 54"

WRITE ON YOUR COMPANY LETTERHEAD FOR CIRCULAR 540-1



INCORPORATED

12 CHARTER OAK BLVD., WEST HARTFORD 1, CONN.

BRANCH OFFICES . . . BIRMINGHAM • BOSTON • CHICAGO CINCINNATI • CLEVELAND • DALLAS (Southwest Industrial Sales Co.) DETROIT • HOUSTON (Tri-Tex Machine & Tool Co.) • LOS ANGELES NEW YORK • PHILADELPHIA • PITTSBURGH • ROCHESTER SAN FRANCISCO • ST. LOUIS • EXPORT DEPT., WEST HARTFORD

FIRST CHOICE FOR ACCURACY

Pi

MACHINE TOOLS . CUTTING TOOLS . GAGES

1860

ONCE IN A BLUE MOON



Jones & Lamson is in the habit of coming up with excellent turret lathe developments, but only "once in a blue moon" do we offer so many at once.

All-out efforts in research and development have been turned towards designing machines that will reduce costs, increase production and keep both operators and management happy.

Here are some of the results:

We've developed simple "on-the-machine handling" with effortless and integrated control through Hydra-Clutch Headstocks and Geneva Saddles.

We've combined necessary horsepower with field-proven experience on how to use it.

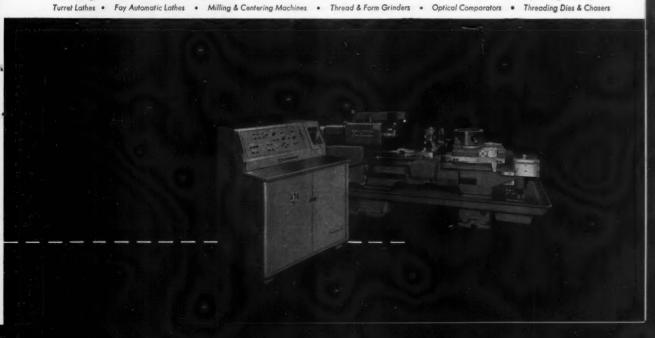
We've combined two-way tracing with normal turret lathe operation.

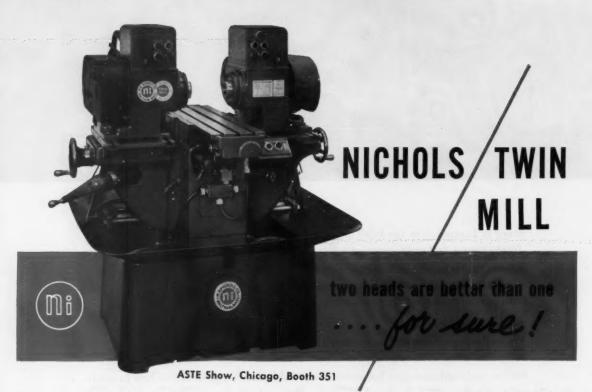
We've increased versatility and operation ease by means of tape-controlled turret lathes with pre-set tooling. Set-up is so quick it makes even "one piece" production as feasible as long run jobs.

We've perfected automatic thread chasing on standard turret lathes thereby reducing idle time and increasing accuracy and production.

These and other engineering achievements are bound to help your plant operation. Write Dept. 710 today for literature and technical data.







The Nichols Twin Mill is something new in duplex millers — a precision 2-spindle bed-type miller designed for simultaneous light duty milling of apposite or adjacent surfaces, using horizontal or vertical spindles.

The Twin Mill provides unmatched flexibility! It is equally adaptable for long-run or short-run jobs. The two geared milling heads are independent units, with separate 1 HP motor drives, and are quickly adjusted either directly opposed or offset longitudinally, vertically or transversely. Set-up is fast and simple.

The wide range of spindle speeds from 55 to 2050 R.P.M. allows milling of ferrous or non-ferrous materials with high speed or carbide tipped cutters, producing EXTRA FINE FINISH while maintaining the closest tolerances with ease.

The Twin Mill is completely push-button controlled, arranged for automatic table cycling — with rapid approach, hydraulically controlled variable cutting feed and rapid return. Available with automatic retraction of milling heads, automatic spindle brakes and carefully engineered special features to meet specific applications.

The parts shown are typical of those on which the Twin Mill is cutting costs and boosting production. Investigate the savings it can make for you. For details write to Nichols-Morris Corporation.

CONDENSED SPECIFICATIONS

Table, working surface	8%" x 30"
Table Travel - cutting stroke	1134"
Motors	(Iwo) 1 HP
Spindle Speeds (15) from 55 to	2050 RPM
Max. height center of spindle above table	11%"
Max. offset of spindles thorizontal	81/2"
Max. distance between spindle noses (across table)	16"
Floor space required	64" x 56"



Manufactured by W. H. Nichols Company, 48 Woord Avenue, Waltham 54, Mass.





Owned by Jessen Manufacturing Company, today's most advanced automatic screw machine uses Cities Service Cutting and Hydraulic Oil

Weighing 39 tons and powered by a 60 H.P. motor, this 6-inch, 6-spindle Acme Gridley Automatic Screw Machine is one of the only six now in existence . . . and the only one owned by a job shop. Featuring a combination pneumatic-hydraulic operation, it can turn out a single load of stock weighing 3 tons!

The owner is Jessen Manufacturing Company of Elkhart, Indiana—since 1923 famous for keeping on top of new developments. It's not strange, therefore, that for this advanced new machine they chose a top quality coolant—a Cities Service cutting fluid.

Says President J. H. Jessen: "We're happy to say that the Cities Service cutting oil we use today is one of the finest all-around cutting oils we have ever used. In years past, we felt that if a cutting oil was good, it had to be black, heavy, and odorous. Cities Service has changed our minds with a cutting oil that has outstanding cooling abilities, good chip drain-off, is anti-weld... and yet possesses light, clear color and has no noticeable odor. In addition, Cities Service Pacemaker Oil used in hydraulic systems, and Amplex Lubricating Oil are doing an outstanding job throughout our shop. We proudly recommend all these Cities Service Oils."

For more information on the complete line of Cities Service cutting fluids, call in a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.



Light, Clear Coolant in Acme-Gridley Automatic is Cities Service cutting oil. "Outstanding cooling, anti-weld, and chip drain-off ability," says Jessen. Firm also praises Pacemaker Oils, used in their hydraulic operations.



Jessen Mfg. Company., Inc. Mr. Jacob Jessen, Pres., in business since 1923, has earned reputation of keeping on top of new developments. In 1935, he was one of the first to install 6-spindle, anti-friction bearing screw machine.

CITIES (SERVICE

QUALITY PETROLEUM PRODUCTS



SPECIFICATIONS

Hole through spindle 1%"
Maximum collet capacity
Swing over bed
Spindle speeds (Approx.)20 to 945 r.p.m.
Effective feed of turret
Diameter of holes in turret head
Thread cutting range4 to 224 per in.
Motor required (Two-Speed) 2 - 1 h.p.

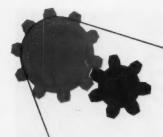
The South Bend No. 2-H Turret Lathe has the stamina for exacting close-tolerance work, rigidity for producing fine finishes and ample power for smooth performance. It also has full quick change gear mechanism providing 48 power feeds for the turret ram, 48 power longitudinal feeds for the universal carriage and 48 power cross feeds for the double tool cross slide. The wide selection of feeds insures maximum machining efficiency on every type of operation. Where can you find a better turret lathe value?



DUPLEX TURRET TOOL HOLDER—With this Duplex Turret Tool Holder, two tools can be mounted on one face of the turret head. Shank of tool holder fits into turret head and tools are mounted in two holes in holder. Lever on holder is used to turn each tool into operating position as required. Adjustable stops position tool with sufficient accuracy for most drilling, reaming or tapping operations. Shank sizes \[\frac{9}{4}'' \] to \[\frac{1}{2}''' \] diameter. Priced from \[\frac{9}{2} \] to \[\frac{9}{4} \] each. Write for specifications.

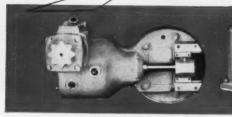
SOUTH BEND LATHE





Hob today at tomorrow's speeds

> with the new Lees-Bradner Model 7, Type HD Single Spindle, High Speed Hobbing Machine



Close-up shows new, heavier hob head with Timken bearing construction, 3-inch hob shift

Capacity TODAY to meet tomorrow's production requirements is a built-in bonus feature of Lees-Bradner Hobbing Machines.

The new Model 7, Type HD Single-Spindle High Speed Hobber for example, is a heavier, faster machine than its prototype. Weighing approximately 1,000 lbs. more, a heavier headstock and heavier column gives you the added rigidity to perform better and faster the excellent job done by its predecessor, the Type "A". tomorrow, as well as today, offers savings in time and labor. To industry, constantly pressed for higher production, these savings mean more than

For the whole story and a demonstration, contact your Lees-Bradner representative. Or, write us direct.

Designed-in production capacity to take care of dollars. They mean satisfied customers.



For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956—103



If an automation program is in your present or future plans, write, wire or phone for full details on these units and other standard Swanson components and accessories.



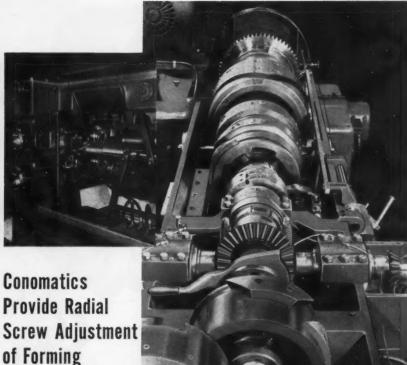
Quality

TOOL & MACHINE PRODUCTS INC., ERIE, PA.

Gince 1919

ENGINEERS and BUILDERS of AUTOMATIC and SPECIAL PURPOSE MACHINES





Models 25/8" LA, 31/2" AD, 5" KL, and 51/4" KR Conomatic Four Spindle Bar Machines are equipped with a number of quick job-change features. One of these is the all-position end attachment drive for the mounting of endworking opposed spindles in all positions, with independent feed to as many as three opposed spindles on a single setup.

Tool Slides

Another feature that is of considerable importance in tooling up is the radial screw adjustment of all sideworking slides. Trial cuts may be taken to correct diameters with form tools without changing the clamped positions of the form tool holders.

All Conomatic quick changeover models are equipped with dial adjustment of the working stroke of all tool carrying slides. Besides the Four Spindle machines there are three quick change Six Spindle models in $\frac{9}{16}$, 1" and $\frac{15}{8}$ " sizes. Write, wire, or phone for literature.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.





Caught in the middle?

If grinding problems have you caught in the middle and you don't know which way to turn, switch to CINCINNATI (PD) WHEELS. For now CINCINNATI Grinding Wheels offer POSITIVE DUPLICATION—a remarkable achievement in precision manufacturing and quality control that can save you money . . . and increase your production.

Here's why you'll stop leading a dog's life when CINCINNATI (PD) WHEELS are on the job: Through the CINCINNATI (PD) Manufacturing Process you are assured Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS are priced no higher than ordinary wheels. So, we think you'll agree it's worth taking a close look at CINCINNATI (PD) WHEELS right away.

Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

Remember-only CINCINNATI Grinding Wheels give you . . .

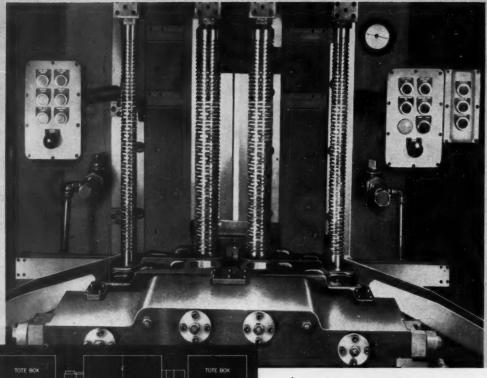


POSITIVE DUPLICATION

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.



DETROIT BROACH PULL DOWN MACHINE BROACHES FOUR HOLES IN SIDE BARS



TOTE BOX

FEJECTING CYLINDERS

BROACHING
POSITION

*PARTS BROACHED AND UNLOADED AUTOMATICALLY!

*HOLE LOCATION HELD WITHIN .002"

The operation described at the right is typical of the production economies and efficiency which are characteristic of Detroit Broach engineering. Such efficiency provides automatic parts handling in conjunction with automatic machine operation and thus reduces labor costs and error.

Whether your operation calls for a single unit-type operation or a broaching operation that is tied directly into automated production, you can rely on Detroit Broach engineering to provide the machine and tooling that will do the job dependably.

The Cycle

-This set-up to broach two holes in each of two side bars per pass is mounted on a standard Detroit Broach 25-ton Vertical Pull-Down machine with a 54' stroke. The operator simply loads two parts per cycle and pushes the start buttons... the balance of the operation, including unloading, is completely automatic.

When the start buttons are pushed, the parts are carried by a tray into broaching position and the broaches are automatically lowered and engaged into pullers. The tray returns to loading position as the machine is broaching. When the machine reaches the bottom of the down stroke, ejectors are energized which push the parts into unloading troughs and the parts slide down into tote boxes.

The parts are alloy steel forgings, core drilled prior to broaching. The broaching operation finishes the holes and corrects hole location within .002" total tolerance. This accuracy is made possible by exclusive Detroit Broach Pull-Down design in which the tool handling slide gives rigid support to the broaches and follows them throughout their entire cutting stroke.

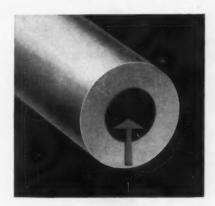
Detroit Broach

OFFICES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

ROCHESTER, MICHIGAN



a hole here costs money...



a hole here saves money

Crucible Hollow Tool Steel Bars put savings into the pockets of the metalworking industry. There's no need for costly drilling, boring, cutting-off or rough-facing operations. For the hole is already in the steel you buy. You save production time, machine capacity—avoid scrap losses.

Crucible Hollow Tool Steel Bars are now available in any of our famous tool steel grades . . . in almost any combination of O.D. and I.D. sizes. And you get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels.

Your Crucible representative can show you how to save time and money with Crucible Hollow Tool Steel Bars. Crucible Steel Company of America, Oliver Building, Pittsburgh 30, Pa.



first name in special purpose steels

Crucible Steel Company of America



if 4½ percent interest is "gilt-edge"

To many investors, a conservative security that consistently yields 4½% is considered "gilt-edge." But here is an investment that consistently yields 50% or more a year—with no risk to you.

To drill oil holes in this crankshaft with standard equipment and obtain 46 cranks/hr. would take many machines and operators.

With the Avey machine and one operator, unit costs drop so far that the machine is paid for in less than 18 months.

The 14-station machine has Line-O-Dex indexing, automatic hydraulic clamping and positioning, and drills ½" holes with Aveydraulic Torquematic deep hole drilling units.

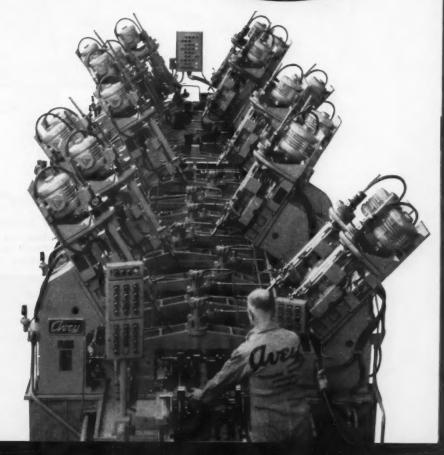
When this order is complete, or the part changes in design, the Avey standard units can be rearranged for a new job an economical way to extend the life of your investment.

Avey's pay-as-you-produce plan helps you make this fast-earning investment now. Whether your part is a crankshaft or a door check—ask Avey for a profit prediction.

THE AVEY DRILLING MACHINE CO., CINCINNATI I, OHIO drilling, tapping, production machines

... what's 50 percent?







PROBLEM

1. lower stator brame

1. lower stator brame

2. increase production and activacy

2. increase production and activacy

3. hum any one of four different

3. hum any one of parts



MACHINING NECESSARY

Drill 8 holes Chamfer 8 holes Tap 8 holes Bore two inside diameters Rough face ends Remove chips

for problems in Drilling, Boring, Facing and Tapping

Call a Natco Field Engineer

CHICAGO, Room 203, 6429 W. North Ave., Oak Perk
DETROIT, 10138 W. McNichels Rd. • BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon

NEW NATCO HOLEWAY

cuts costs and increases production... and accuracy by combining operations!



ESTIMATED GROSS PRODUCTION PARTS PER HOUR

OPERATIONS

STATION No. 1 Load 1 part. STATION No. 2

R. H. Horizontal Head Combination rough bore for 10.492/10.490 half thru, rough bore for 12.064/-12.062 diameter, finish bore 10.520/10.510 diameter and rough face end.

L. H. Horizontal Head Drill 4 holes

STATION No. 3 STATION No. 4

R. H. Horizontal Head Drill 4 holes

L. H. Horizontal Head Combination rough bore for 10.492/10.490 diameter rough bore for 12.064/12.-062 diameter and rough face end.

STATION No. 5

STATION No. 6 R. H. Horizontal Head Tap 4 holes

L. H. Horizontal Head Tap 4 holes STATION No. 7

STATION No. 8 R. H. Horizontal Head

L. H. Horizontal Head Finish bore to 10.492/10.490 diameter thru.

STATION No. 9

Blow chips out of center bore and 8 tapped holes (4 each side) and blow chips off top. STATION No. 10

Unload 1 part. Part to be unloaded onto gravity conveyor.

NATIONAL AUTOMATIC TOOL COMPANY, INC.

RICHMOND, INDIANA

Model 42B84S Lucas short bed-length Precision Horizontal Boring, Drilling and Milling Machine

more Lucas in less space

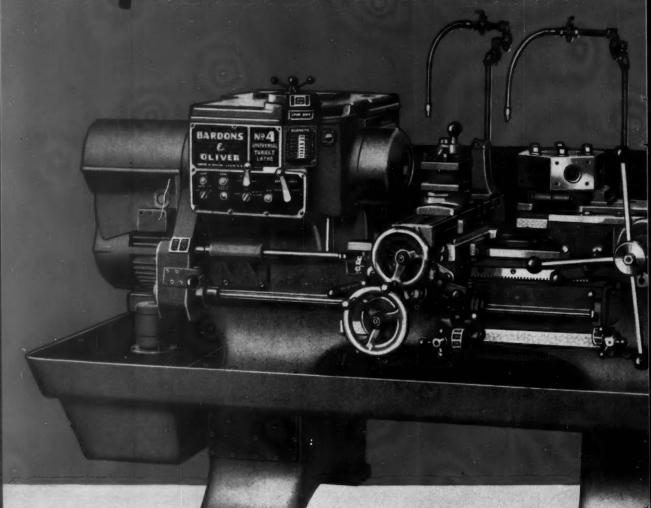
This new horizontal boring, drilling and milling machine is a space and money saver on work where a backrest is not required. Lucas leads the parade by concentrating all its efforts on horizontal boring machines—by constant improvement, by incorporating every advance immediately. Every worthwhile improvement will be found first in a Lucas. Lucas Machine Division • The New Britain Machine Company, 12302 Kirby Ave., Cleveland 8, Ohio.

A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two- or four-way beds optional.

LUCAS OF CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

THE NEW BARDONS & OLIVER No. 4 Universal Turret Lathe...





Write us on your company's letterhead for this new Catalog. The new No. 4 Universal Turret Lathe incorporates many new features which have sharply increased its productive capacity while lessening the physical effort required of the operator.

A larger selection of spindle speeds, covers a wider overall range. Spindle speeds are instantly preselected and changed. Tool carrying stations have increased rigidity and accuracy. Controls are regrouped for handier and faster manipulation. Wider selection of feeds are provided with positive jaw feed clutches and easier engagement levers.

Power transmitting capacity is adequate to accommodate motors of ample horsepower for the latest developments in cemented carbide tooling.

We welcome the opportunity to quote production estimates on individual requirements.

Features:

- Sixteen Geared Spindle Speeds, providing a fifty to one speed range.
- Three optional spindle speed ranges with maximum up to 2000 R.P.M.
- Constant Horsepower (optional to fifteen) at all spindle speeds.
- Fast operating and effortless
 Electric Headstock Clutches.
- Fully Automatic Spindle Speed Changing.
- 100% anti-friction bearing headstock and aprons.
- Flanged Type Motor Mounting with reduced overhang.
- Diagonal Cross Ribbing full length of bed and underneath headstock.
- Replaceable Bed Ways of Solid Hardened and Ground Alloy Steel.
- Replaceable Hardened and Ground Steel Turret Slide Saddle Ways, Gibs, and Top Caps.
- Large HexagonTurret and deep Turret Slide of exceptional accuracy and rigidity.
- Twelve Quick Feed Changes

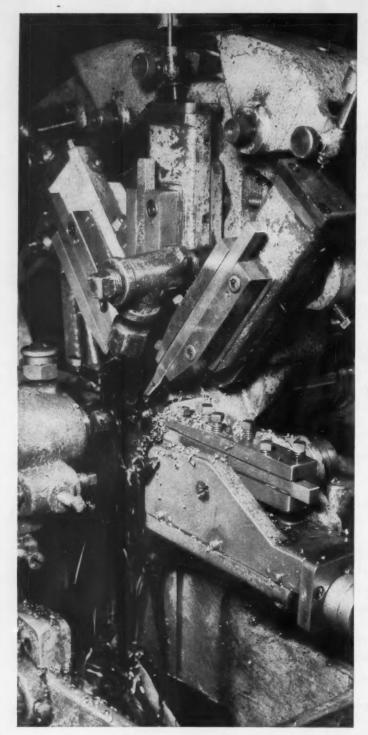
- for Cross Slide, Carriage and Hexagon Turret.
- Single Dial Feed Selectors on both Aprons.
- Positive Tooth Feed Clutches with "Easy Action" Engagement Levers.
- Sealed Carriage and Saddle Aprons.
- "One Shot" lubrication of all Tool Slide Ways.
- Accurate and Rigid Square Turret Sealed by Protective Skirt.
- Large Hardened and Groundin-Thread Ball Bearing Cross Slide Screw.
- Anti-Backlash Adjustable Nut on Cross Slide Screw.
- Built-in Bar Feed Stop providing extra Turret Tool Station.
- Faster Hydraulic Bar Feed and Collet Chuck.
- Only one Bar Feed Setting for a full length of Bar Stock.
- Impeller Type Coolant Pump with Integral Motor Drive.
- Optional Collet Chuck Capacities (2" or 2½" diameters).

MANUFACTURERS OF TURRET LATHES AND CUTTING-OFF LATHES

BARDONS & OLIVER, Inc.

1135 WEST 9TH STREET

CLEVELAND 13, OHIO



"Cleartex helps us hold to close tolerances"

—says Mr. Jack J. Waldman, Plant Manager, Joseph Waldman & Sons, Irvington, New Jersey

HERE'S a plant that specializes in machining and threading intricate parts for the Watch and Aircraft Industries—working to very close tolerances. Mr. Waldman tells how Texaco helps:

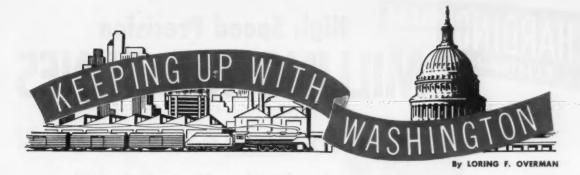
"Our automatic screw machines are called upon to do some mighty accurate machining. We're glad we followed our Texaco Lubrication Engineer's recommendation and are using Texaco Cleartex Oil as both a cutting fluid and a machine lubricant. We find we get more pieces per tool grind, better finish, and lower unit costs. In addition, our machines are as clean as you'll find anywhere."

Regardless of the metal being worked, or the method of machining it, there is a *Texaco Cutting, Grinding or Soluble Oil* to help you do your jobs better, faster and at lower cost. A Texaco Lubrication Engineer will gladly give you full particulars.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.



TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE on TV Sat. nights. METROPOLITAN OPERA radio broadcasts Sat. afternoons.



Recent Machine Tools May Have Inspired Government Inaction

WASHINGTON'S signals to the machinery building industries were a bit garbled as the nation's capital awaited the second session of the Eighty-Fourth Congress; a year of political maneuvering; and possibly some warmed-over cold war. However, one thing is certain: former big customer Uncle Sam has virtually taken himself out of the machine tool picture pending a review of the demand, inventory, and supply outlook. The Defense Department and the Office of Defense Mobilization are again studying the machine tool situation, which continues to puzzle defense planners. The once popular idea of keeping complete machine tool packages intact-either in storage or idle in stand-by factories ready for use in an emergency-

is again coming in for criticism. It is probable that the recently exhibited machine tools, which have spurred industry into buying action, have also inspired Government inaction. Some Government officials are questioning the wisdom of stockpiling large inventories of machines already becoming obsolete, without ever having been used. Also, planners are finding that some of the proposed machine tool packages are designed to manufacture weapons that have been scrapped because of the development of newer types.

Under such conditions, ODM and DOD officials are leaning toward the idea of breaking the once sacred packages and making immediate use of some of the more needed items. So again, the military machine tool program becomes acute. The need for an ever modern production base is recognized, but keeping it up to date in the face of supersonic speeds and Buck Rogers weapons is no small task.

More and Bigger Presses

An early decision is anticipated as to whether the Air Force will order new and bigger extrusion presses. Under consideration is a 20,000-ton press of a type cut back for economical reasons during the first year of the Eisenhower administration. At that time, it was held that the Air Force should first try its wings on smaller presses, basing future plans on their success. In the cutbacks, plans for the 20,000-ton press were abandoned, together with plans for four forging presses and two other extrusion presses of 8000- and 12,000-ton capacity. Work with the test extrusion facilities has been progressing satisfactorily, and ample order backlogs are now the basis for a recommendation that the extrusion press program be reactivated.

Ratio Spending Proposed

Failure of the Big Four Foreign Ministers' Conference to bring about peace guarantees or armament reduction pledges means that any hopes for reduced defense budgets have disappeared. Defense Secretary Charles E. Wilson has suggested that the defense budget be flexible, and tied to the gross national product. That total, estimated at four hundred billion dollars for 1956, would permit a tidy sum for defense if the same percentage allowed for this year were continued. Mr. Wilson, original exponent of the idea of "a bigger bang for a buck," is reported to be finding defense economies extremely elusive. He points out that whenever savings are made in one direction, a new requirement shows up in another.

Signs of the Times

Despite cold wars and rumors thereof, the road ahead is not at all bleak, as seen by Washington observers.

There is ample evidence that prosperity need not hinge on Government spending. Since 1953, the United States Chamber of Commerce points out, Federal spending has dropped 15.6 billion dollars—from 16.5 to 11.6 per cent of the gross national product. During the same two and one-half year period, spending by consumers increased 25.1 billion dollars and private investment 5.7 billion dollars—a total increase of 30.8 billion dollars.

By 1980, according to the Federal Power Commission, the nation's annual electric energy requirements will reach 1696 billion kilowatt-hours, more than three and one-half times the 478 billion kilowatt-hour total for 1954.

A billion dollars is to be invested during the next five years by the Chrysler Corporation in new facilities and to broaden research on revolutionary automobile engines. Speaking before Washington newsmen, Chrysler President Lester L. Colbert said that one of the most powerful stimulants to the economy at the present time is the investment in plants and equipment by industry generally to prepare for "the tremendous markets that are going to open up in the years ahead."

Machinery building people who are looking forward to the needs of tomorrow will find interesting tips in the Government's "Index of Patented Inventions," containing 21,000 items. Included are descriptions of 5000 Government-owned patents available without payment of royalties, and 16,000 inventions which can be obtained on a license basis from inventors or owners. Patent Office officials say that industry will have to make its own arrangements for perusing the index in the Public Search Room of the Patent Office in Washington.

Output per man-hour in manufacturing is still rising fast, according to the Federal Reserve Board production figures and the Bureau of Labor Statistics' Index on Man-Hours. Durables showed a 5 per cent gain in output per man-hour during the first nine months.

Guide lines intended to settle arguments over industrial dispersal have been issued for the benefit of military departments by Deputy Defense Secretary Reuben B. Robertson, Jr. The guide lines are contained in Defense Department Directive No. 5220.5, dated November 17, 1955. Mr. Robertson made it plain that it was not, and never has been, the intent of the Defense Department to abandon existing production facilities or to bar relatively minor new construction adjacent to such facilities.



High Speed Precision MILLING MACHINES



OFFICES IN PRINCIPAL CITIES. Export Office: 269 Lafayette St., New York 12, N. Y.

What's Ahead for 1956?

ON the threshold of any new year it is the general custom to review the events of the immediate past and make a prognostication of what lies ahead. In 1955, our country enjoyed the most prosperous year of its history. The national income ran to an unprecedented high of considerably more than three hundred billion dollars.

Economists are predicting a continuance of the high business plateau, at least during the first six months of 1956. Then the Presidential election will be uppermost in everyone's mind, and uncertainties are bound to arise as to whether there will be an Administration in the White House for the following four years just as favorable to business as to the other branches of the economy.

Seldom, if ever, have the voters repudiated an incumbent Administration during a period of high prosperity. The present picture is complicated, however, by the question as to whether President Eisenhower will permit his name to appear again on the ballots. Fortunately for the country as a whole, some prominent Democrats appear to feel that the times call for moderation in political objectives. It is, therefore, conceivable that if a Democrat should be elected to the Presidency, business would not necessarily be treated like the stepchild of the New Deal era.

So 1956 should be another year of prosperity, especially for the machine-building and machine-using industries. Expenditures al-

ready authorized for industrial plants and equipment for next year are breaking the high record of the year just ended.

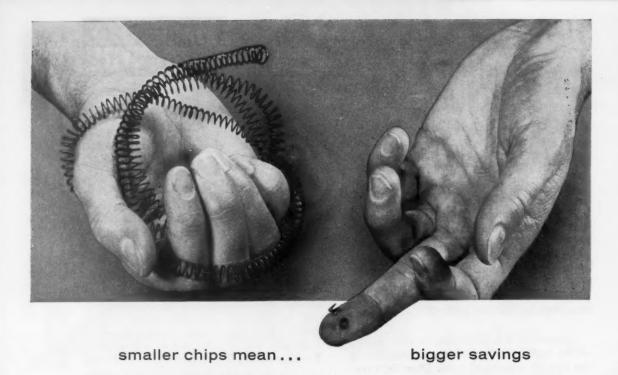
Machine tool builders are particularly optimistic. New orders for the month of October amounted to over one hundred million dollars, and were the highest for any month since July, 1952. The orders undoubtedly were a reflection of the Machine Tool Show, but it is believed that they indicate a new pace in modernization of industrial plants that will continue for months to come.

General prosperity will certainly foster additional developments in automated equipment, not only in big metal-working plants, but also in a wide range of industrial enterprises not ordinarily considered within the realm of automation. Already automation is being applied in the production of pretzels and cookies; the processing and packaging of milk; and the washing, blending, storing, and loading of coal.

All such equipment must, of course, be produced by machine tools equipped with cutters and other accessories. The more money spent on automation, the more prosperous the machine and tool manufacturing branches of industry will be.

The prospects for a high level of prosperity in 1956 are pleasant to contemplate.

Charles O. Herb



Cut costs with RYCUT steels!

Three new Ryerson leaded alloys

These short, fast-breaking chips have real meaning to cost-conscious purchasing and production men. In an ever-increasing number of shops, small chips like these mean that the switch has been made to Rycut steels. They mean that tools are turning faster—that production is up as much as 200%.

The secret of Rycut's machining speed is a minute quantity of lead, finely dispersed throughout the steel. This acts as a lubricant between tool and steel. The results are revolutionizing machine shop practice:

- Up to 200% more parts can be produced per machine hour!
- Tool life is lengthened as much as 300%!
- Finish is improved!

There's a Rycut leaded alloy for every application. Use RYCUT 20 when you need a

carburizing alloy; RYCUT 40 for .40 carbon alloy applications; and RYCUT 50 for .50 carbon alloy uses. Every one is a cost-cutter.

Figure how much this increased production and longer tool life would lower costs in YOUR shop—and raise your profits! Call your nearby Ryerson plant today . . . large stocks assure you of quick shipment.

NOW LEADED PLATES—Ryerson's New E-Z-Cut is the first leaded plate steel available from stock. It cuts faster, polishes easier than other free-machining plate steel.

LARGEST LEDLOY STOCKS? Ryerson has them and this leaded carbon steel is the world's fastest cutting.

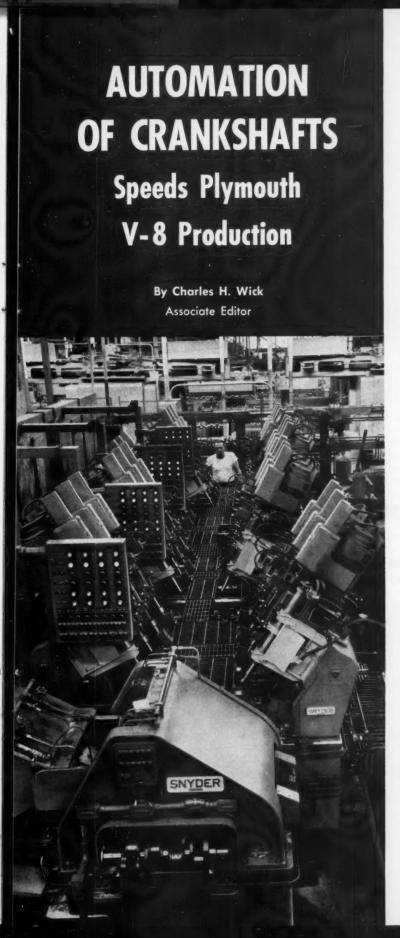
RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloy and stainless steel, reinforcing bars, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK . BOSTON . PHILADELPHIA . CHARLOTTE, N. C. . CINCINNATI . CLEVELAND DETROIT . PITTSBURGH . BUFFALO . CHICAGO . MILWAUKEE . ST. LOUIS . LOS ANGELES . SAN FRANCISCO . SPOKANE . SEATTLE

122-MACHINERY, January, 1956

For more information fill in page number on Inquiry Card, on page 221



A major innovation in Plymouth's "Qualimatic" V-8 engine plant is the widespread use of automation in crankshaft production. After manual loading of the Fitchburg milling machines used for the first operation, the crankshafts are automatically unloaded, conveyed, positioned, and loaded throughout the entire department, which contains more than 100 machines

RODUCTION of Plymouth's new V-8 engine is performed in a plant that is referred to as "Qualimatic" because of the high degree of quality control obtained through automatic processing. The plant, having a floor area in excess of 530,000 square feet, is equipped with the most modern automation equipment, transfer machines, and other automatic machine tools and inspection equipment. An output of 2400 V-8 engines per day is planned.

One major innovation in this plant has been the automation of crankshaft production. Previously, crankshafts, because of their complex shape and the amount and variety of machining required in their manufacture, have prevented more complete automation of automotive engine production facilities. Now, however, Plymouth engineers, working in close cooperation with machine tool builders and automation equipment suppliers, have succeeded in providing automatic loading and unloading devices, as well as positioning and conveying units tying together all machines in the crankshaft department. Over 4000 feet of standardized transfer units are employed to connect the more than 100 machines required.

Crankshafts for the Plymouth V-8 engines are forged from S A E 1040 steel. After heat-treating, quenching, and tempering, the forgings have a Brinell hardness of between 228 and 269. Tolerances on the forging dimensions are maintained closer than

MACHINERY

Vol. 62, No. 5 January, 1956

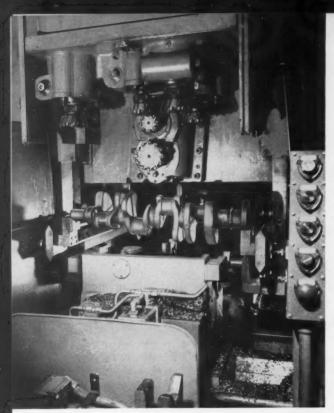


Fig. 1. Six locating spots are milled on crankshaft at the second station of this three-station machine. Loading is manual and unloading automatic.

has been conventional practice, and a spot check is made to detect excessive stock allowances as the incoming crankshafts are unloaded from skids. Also, an inspection is made to insure that the centers in the ends of the crankshafts are in the required relation to their center lines.

The forgings are placed, manually, one at a time, in the loading positions of either of two Fitchburg three-station milling machines. When the work-pieces have been automatically transferred to the second station, they are clamped, and the machine heads are lowered to mill six locating spots on each crankshaft. As seen in

Fig. 1, the head of each machine has six Wesson milling cutters equipped with inserted, tungstencarbide blades.

From the third station at the rear of the machines (Fig. 2), the crankshafts are automatically picked up and conveyed by walking-beam, transverse transfer units to the lower level of a two-tier, main longitudinal transfer line. The parts rest in cradles on this in-line unit, and are intermittently lifted from the cradles, advanced, and lowered into succeeding cradles by pivoting arms that reciprocate with the transfer bars. All the transfer units are hydraulically operated and electrically controlled.

A battery of ten Wickes center-drive lathes is automatically supplied with work-pieces from the lower level of this longitudinal transfer unit. This is accomplished by a transverse conveyor at the right-hand side of each lathe, as seen at the left in Fig. 3. As the crankshafts are indexed along the main longitudinal unit, they are automatically transferred by means of electrical interlock controls to the first transverse conveyor not fully loaded with parts. Since parts will not be automatically unloaded from the transverse conveyors when the center-drive lathes to which they are attached are shut down for tool changes, maintenance, or other reasons, such transverse conveyors and machines will be automatically by-passed by crankshafts on the longitudinal transfer unit.

From the front end of each transverse conveyor, the crankshaft is automatically lifted,

Fig. 2. From rear of milling machine seen in Fig. 1, crankshafts are picked up by walking-beam conveyor and deposited on main longitudinal transfer line.





Fig. 3. Transverse conveyor at left supplies cranks to center-drive lathe, while the conveyor at right returns the machined parts to upper level of main transfer line.

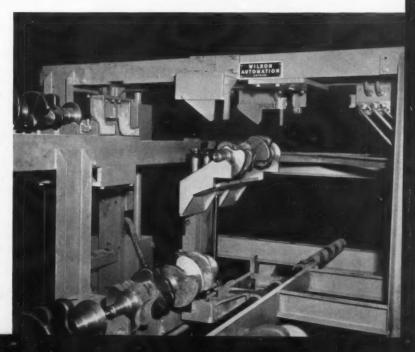
traversed to the left, and lowered between headstock and tailstock centers into the center-drive chuck of the lathe by means of an overhead hoist mounted on the front of the machine. Clamping of the work-piece and the machining cycle are also completely automatic. Twenty-six high-speed steel tool bits are employed in this operation to rough-turn the five main bearings, oil-seal surfaces, and gear and pulley fit surfaces, as well as to finish-face both ends of the crank-shaft. The work rotates at 55 R.P.M., while the tools are fed at rates varying from 0.010 to 0.038 inch per revolution.

When machining has been completed and the part unclamped, the hoist automatically lifts the crankshaft from the lathe, traverses it to the left, and lowers it onto the front end of an

inclined transverse conveyor at the left of the machine. These walking-beam transfer units, such as the one seen at the right in Fig. 3, carry the crankshafts to the upper level of the two-tier, main longitudinal transfer line. From this point, the parts are intermittently lifted, advanced to the left, and lowered until they reach the end of the main transfer unit, shown at the upper left in Fig. 4.

Here an ingenious device is employed to traverse the crankshafts to the right and lower them to the lower level of another two-tier, main longitudinal transfer line, which is parallel to the first. The lower level of the second main transfer line supplies parts to transverse conveyors provided on the right-hand side of six LeBlond double-end drive, crankshaft lathes, and the upper level

Fig. 4. Crankshafts from upper level of one main transfer line (top left) are automatically traversed to the right and lowered to lower level of a parallel main transfer line.



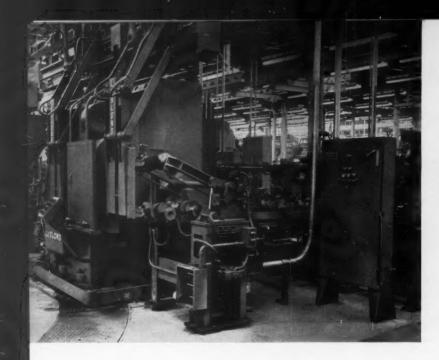


Fig. 5. Automation device at the right of double-spindle lathe stacks crankshafts two high for automatic double loading of machine. Unloading is done in same way.

receives crankshafts from unloading transverse conveyors at the left of each lathe.

Since the crankshaft lathes have two spindles, arrangements had to be provided for automatically loading and unloading two parts at a time. This was done by installing a hydraulically operated lifting device at the front end of each transverse conveyor, as seen in Fig. 5. With this set-up, one crankshaft is lifted while another is transferred to the front of the conveyor, directly below the raised part. Then, a two-position automatic loading device, suspended from the front

of the machine, lifts both parts simultaneously, traverses them to the left, and lowers them onto steadyrests between right- and left-hand pot chucks on the lathe. Automatic clamping is performed hydraulically.

On these machines, counterweight cheeks are rough-faced and pin bearings are rough-turned. Right- and left-hand cross-slides on each lathe carry sixteen tool bits, Fig. 6. Machine motions are sequenced electrically and hydraulically for continuous automatic operation. Spindle speeds are varied from 27 to 67 R.P.M. during machining to provide a constant cutting speed of 70 feet per minute, and the feed rates are varied from 0.006 to 0.055 inch per revolution.

After automatic unloading, the crankshafts are carried up the transverse conveyors and along the upper level of the main transfer line to transverse conveyors supplying five Landis 16- by 40-inch, multiple-wheel grinding machines, Fig. 7. Fingers on the automatic loader lift one part from the transverse conveyor at the right of the machine while simultaneously raising a completed part from the grinding position. The loader is hydraulically moved across a rail type transfer fixture, and the completed crankshaft is lowered onto an unloading transverse conveyor while the part to be ground is positioned between headstock and tailstock centers of the machine. The headstock is arranged so that the cam type, quick-acting drive-dogs always stop in positions convenient for automatic load-

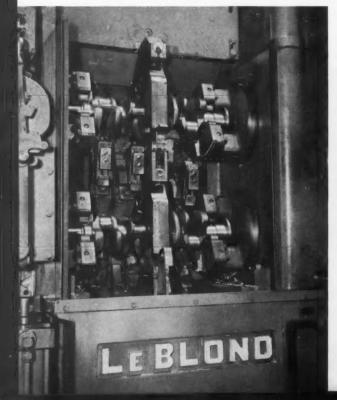


Fig. 6. View of tooling area on doublespindle lathe seen in Fig. 5. Sixteen tool bits rough-face counterweight cheeks and rough-turn the pin bearing surfaces.

Fig. 7. This multiple-wheel grinding machine is automatically loaded from a transverse conveyor at right. The ground shafts are unloaded onto a conveyor at left.



ing. Also, a work-rest having hydraulically operated shoes comes into contact with the work automatically.

In this operation, all the main bearings and oil-seal surfaces are rough-ground simultaneously. The machine head carries six grinding wheels, Fig. 8, 42 inches in diameter and 0.991 to 3.348 inches wide. Vitrified-bond, aluminum-oxide abrasive wheels of 54 grain size, O grade, and No. 3 structure are employed. Dressing of the wheels is done with six diamonds. Approximately 0.025 inch of stock is ground from the various surfaces, and as the work approaches the required size, sizing gages are moved into position manually. When proper size is obtained, the grinding wheels are automatically removed.

When the crankshafts have been automatically

unloaded and returned to the main transfer line by the transverse conveyors, they are carried in a U-shaped path to two Lo-Swing automatic lathes. During this transfer, the work-pieces are automatically swung through 180 degrees in a horizontal plane so that they proceed with their flanged ends trailing.

In the automatic lathe, Fig. 9, the five main bearings and gear-fit surface are undercut; the Nos. 1, 2, 4, and 5 main bearings are finish-faced; and the No. 3 main bearing is semi-finish-faced. The crankshafts are supported between headstock and tailstock centers and clamped by an air-operated, three-jaw chuck. A cutting speed of 349 feet per minute is employed, and the thirteen tool bits are fed at the rate of 0.005 inch per revolution.

Fig. 8. Six abrasive wheels, all 42 inches in diameter, are used on machine seen in Fig. 7 to rough-grind all the main bearings and oil-seal surface simultaneously.

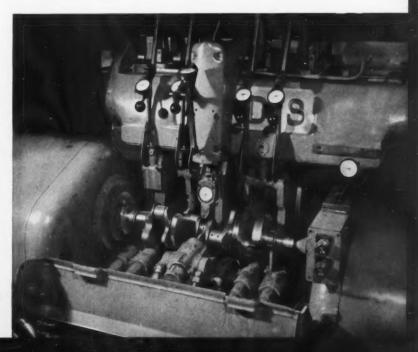
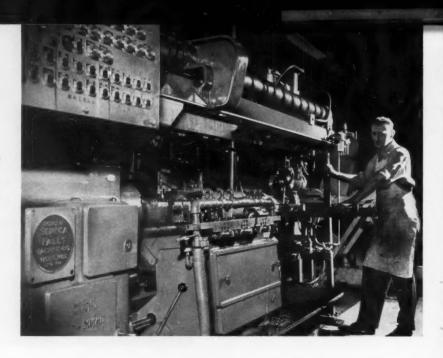


Fig. 9. Main bearing surfaces of the crankshaft are undercut and faced on this lathe, which is automatically loaded and unloaded from transverse conveyors.



At the end of these operations, the crankshafts are automatically unloaded onto transverse conveyors which carry them to the middle level of a third main transfer line, this one having three tiers. From the middle level, the parts enter transverse conveyors beside six LeBlond two-spindle crankshaft lathes which are also automatically loaded and unloaded, two parts at a time. In these machines, the counterweight cheeks are finish-faced and the pin bearings are semi-finish-turned.

The crankshafts are automatically unloaded to the left and carried by transverse conveyors to the lower level of the three-tier main transfer line. Again, transverse conveyors are employed to shuttle the parts to four Jackson crankshaft lathes for finish-turning the pin bearings and forming under-cuts. These lathes are automatically loaded and unloaded, and provided with left- and right-hand pot chucks as well as a hydraulically operated steadyrest for supporting the work. Completed parts are transferred to

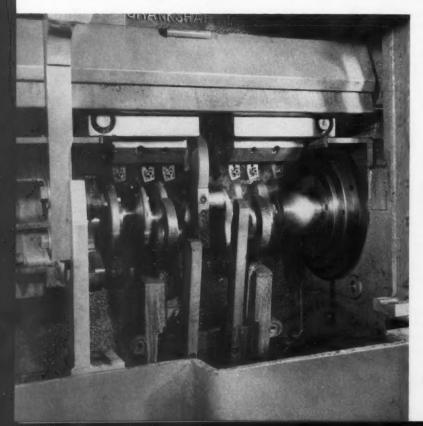


Fig. 10. Counterweights are turned and chamfered as the crankshaft is supported by hydraulically operated pot chuck, collet, and steadyrest in this lathe.

the upper level of the main conveyor by means of an elevator.

A slot is milled in the flange and eight angular oil-holes are drilled in the pin and main bearings on Snyder twenty-four-station automatic transfer machines, such as the one shown in the heading illustration. Four of these machines are automatically supplied with parts from the upper level of the main transfer line. Each machine is equipped with twenty-four Avey angularly mounted, single-spindle drilling units and a special milling head. The drilling units have electrically controlled hydraulic feed and automatically withdraw the drills for clearance of chips when the torque reaches a pre-set amount. A catwalk is provided along the center of the machine, directly above the work-pieces, to facilitate maintenance and tool-changing.

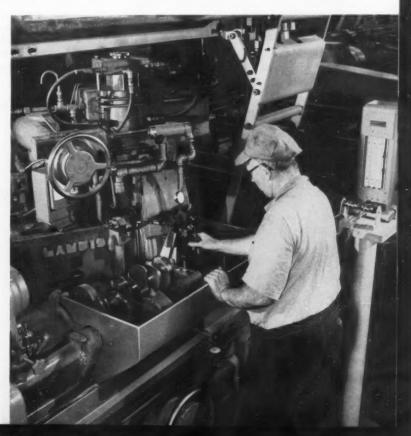
As the crankshafts are intermittently moved from station to station, they are automatically rotated to the required positions by a special arrangement of the transfer bars. The eight 1/4-inch diameter oil-holes are drilled two at a time (one from the left-hand side of the machine and the other from the right) in four groups of three stations each. At the first station in each group, the two holes are drilled to one-third depth; at the second station, to two-thirds depth; and at the third, completely through the crankshafts. The drills are rotated at 688 R.P.M. and fed at 0.005 inch per revolution.

Probes, 0.187 inch in diameter, are fed into the oil-holes at the stations immediately following drilling to insure that the holes have been drilled and that no broken tools remain in them. At Stations 21 and 22, the slot in the flange is rough- and finish-milled by means of a two-spindle head. This single milling head straddles both stations.

The crankshafts are automatically unloaded from the twenty-fourth station of the drilling and milling transfer machine and placed on the upper level of another three-tier, main longitudinal transfer line. During intermittent lifting, advancing, and lowering along this line, the parts are again repositioned so that the flanged ends lead, by automatically swinging them through 180 degrees in a horizontal plane.

From the middle tier of the main transfer line, the crankshafts enter transverse walking-beam conveyors leading to four Jackson crankshaft lathes, which are automatically loaded and unloaded. On these machines, the peripheries of the counterweights are turned and chamfered, as seen in Fig. 10. The work is supported by one hydraulically operated pot chuck, one collet, and a steadyrest. Each machine has six square and twelve triangular, Wesson tungsten-carbide, insert type tools. These tools, like all other single-point tools in the engine plant, have special chipbreakers that eliminate the need for crushers. The work-pieces are rotated at a cutting speed

Fig. 11. Angular-head cylindrical grinding machine for finishing gear and pulley mounting surfaces and gearfit shoulder. Air gage is seen at right.



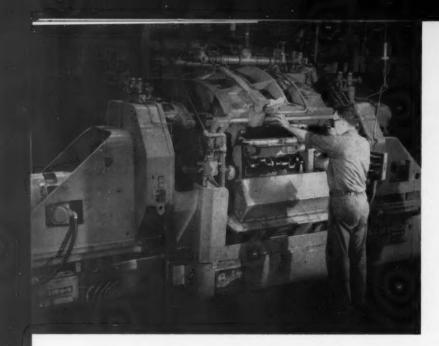


Fig. 12. Both ends of crankshafts are drilled, counterbored, spot-faced, recessed, chamfered, reamed, or tapped on this six-station, two-way, trunnion type machine.

of 250 feet per minute, and the tools are fed at the rate of 0.020 inch per revolution.

Adjacent to each lathe is an Impco 37-ton machine for straightening the crankshafts as they are supported between two live centers and two stationary and three sliding anvils. Because of the close stock allowances on rough forgings and the elimination of too severe clamping during rough machining, it has been found that only about 4 per cent of the parts require straightening at this point in the processing. Final straightening is required on only about 1 per cent of the production.

After straightening, the work-pieces are carried by transverse conveyors to the main transfer line. At the end of this line, a device similar to the one shown in Fig. 4 traverses the crank-

shafts to the right and lowers them to the lower level of another parallel, main longitudinal transfer line. Transverse infeed conveyors supply the parts to five Cincinnati special, two-head grinding machines, which are also automatically loaded and unloaded. Here, the side walls of the No. 3 main bearing are finish-ground to the required width, and the flange periphery and face are finish-ground. The two vitrified-bond aluminum-oxide grinding wheels are 36 and 42 inches in diameter, 54 grain size, M grade, and No. 6 structure. Profiling attachments are provided for truing the wheels.

The five main bearings and oil-seal surface are finish-ground on Landis six-wheel grinding machines, similar to the ones employed for roughgrinding (shown in Figs. 7 and 8). Six of these



Fig. 13. This four-station transfer machine for finishboring and reaming the pilot hole and milling a keyway has built-in air gage to check pilot-hole size.

machines are used, and they are supplied with parts from the upper level of the main transfer line by transverse infeed conveyors. Outfeed conveyors carry the parts to the lower level of the main line. Approximately 0.020 inch of stock is removed from each surface in a completely automatic cycle, holding size within 0.0005 inch.

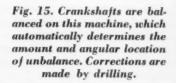
Gear and pulley mounting surfaces, as well as the gear-fit shoulder, are finish-ground on five Landis 30-degree angular-head cylindrical grinding machines, such as the one seen in Fig. 11. The crankshafts are automatically loaded from transverse conveyors into a pot chuck and workrest. A form bar and follower permit automatic diamond dressing of both the face and side of the 30-inch diameter wheel. A Foster electric grinding gage is provided for inspecting the work diameter directly and controlling the wheel feed accordingly, and a Sheffield multiple-column Precisionaire gage is used for a final check.

After automatic unloading, the crankshafts are transported to the upper level of the main longitudinal transfer line by transverse outfeed conveyors. From this line, the work-pieces are manually unloaded and placed in the first station of one of three Buhr six-station, two-way, trunnion type machines, Fig. 12. When the part has been indexed to the second station, a hole 11/16 inch in diameter by 1.620 inches deep is drilled in the front end, and nine holes varying from 7/16 to 57/64 inch in diameter are drilled in the flanged end.

At the third station, the front end is spotfaced to provide the required over-all length of 25.340 inches, and a recess is formed in the flanged end by means of a special counterboring tool and rotary type bushing. The front end of each crankshaft is counterbored and chamfered,



Fig. 14. Diameter, taper, out-of-round, "hour-glass" condition, run-out, and width of various crank surfaces are checked on this multiple-column air gage.





a hole 27/32 inch in diameter is drilled to a depth of 2.620 inches in the flanged end, and the eight holes in the flange are chamfered at the fourth station. When the shaft has been indexed to the fifth station, the nine holes in the flanged end are reamed.

The front end of each crankshaft is tapped with 3/4-16 U.N.F. threads to a depth of 1.180 inches, and the pilot hole in the flanged end is chamfered at the sixth station. When the shafts are returned to Station 1, they are manually unloaded and returned to the main transfer line.

Eighteen Landis semi-automatic, hydraulic, grinding machines are employed for finishing the four pin bearing surfaces on each crankshaft. One pin is ground at a time, then the pot chuck is released and the shaft is indexed to position the next pin. A Foster double-contact Electrosize gage with dial indicator graduations in 0.0005 inch increments and a Sheffield three-column Precisionaire gage are used to maintain the pin bearing surface diameters between 2.1250 and 2.1255 inches.

The pilot hole in the flanged end is finish-bored and reamed and a keyway is milled in each shaft on the Ex-Cell-O four-station transfer machine seen in Fig. 13. Although this machine is automatically loaded from the main transfer line, the automation equipment is not shown, as the photograph was taken before it had been connected. At the second station, the crankshaft is

gripped by a hydraulically operated, self-centralizing chuck, mounted on the slide at the left, and supported on a locating block having carbide inserts while the pilot hole is bored with a tungsten-carbide bit. When the work-piece has been indexed to the third station, the pilot hole is reamed, using a carbide tipped reamer.

Approximately 0.012 inch of stock is removed from the pilot hole in boring and reaming, employing a cutting speed of 45.5 feet per minute and a feed of 0.010 inch per revolution. A unique feature of the machine is a built-in Sheffield inspection unit, seen at the upper right, which has an air gage for checking the pilot-hole size. The bore is held to size within plus or minus 0.0005 inch, and concentric with the main bearings within 0.001 inch total indicator reading.

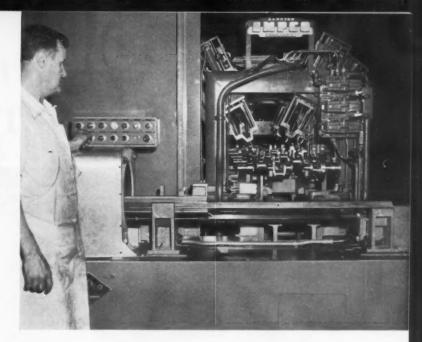
At the fourth station, a keyway is milled in the front end of the crankshaft. Crankshafts requiring straightening pass through Impco 37-ton hydraulic machines. As previously mentioned, very few parts need this operation.

Inspection of the crankshafts is performed on Sheffield multiple-column Precisionaire gaging fixtures, such as the one seen in Fig. 14. Here the outside diameters of the Nos. 1, 2, 3, and 4 main bearings are each checked in two places, and the No. 5 main bearing in three places to determine size, taper, out-of-round, "hour-glass" condition, and run-out. Also, the diameter and width of all pin bearings are inspected, as well



Fig. 16. Polishing of all main and pin bearing surfaces, No.3 main bearing side walls, and oil-seal surface is performed on this machine with 240-grit emery cloth. The oilseal diameter at No. 5 main bearing is also knurled.

Fig. 17. A twelve-station automatic transfer machine is employed for demagnetizing the crankshafts as well as brushing and flushing out the angular oil-holes.



as the width and run-out of the thrust walls on the No. 3 main bearing. These gaging fixtures are manually loaded and unloaded, the parts being obtained from the main overhead transfer line. When the inspection indicates that the crankshafts are out of line, they are straightened. At this point in the processing, the oil-holes are chamfered by means of burring cutters and air motors and the locating spots and keyways are deburred with a file.

For testing the balance, four bob weights are assembled on the pin bearing surfaces to simulate the weight of pistons and connecting-rods, and the crankshafts are placed on an overhead conveyor leading to a battery of seven Tinius Olsen dynamic balancing and correcting machines. In these machines, the amount and angular location of dynamic unbalance are automatically determined, and holes of the required depth are drilled in the crank counterweights to correct the unbalance within 0.25 ounce-inch of perfect dynamic balance.

The crankshaft is supported on two of its main bearing surfaces by rollers on the machine carriage and rotated by pins which enter the holes in the flange of the shaft, Fig. 15. With first one end of the work clamped, and then the other, deflection of the carriage is picked up electrically and transmitted to dial indicating instruments. Servo systems automatically set the angle and depth to be drilled by 1-inch diameter twist drills in the Nos. 1 and 8 counterweights. An electronic Electrodyne memory unit retains all the information until the cycle is completed. Also, both the amount and angular location of the unbalance can be observed on two dial indicating electrical instruments and by angle-indicating reference points on a scanning screen.

When the reference points are aligned with lines on the screen, the crankshaft is automatically rotated to the position required for drilling. After drilling, it is again inspected for unbalance. Signal lamps indicate whether or not the part is within the desired unbalance limits. Again, close control of the forging tolerances and careful machining have made it necessary to drill only two out of five crankshafts to correct for unbalance.

After removing the bob weights and deburring any holes drilled to correct unbalance, the crankshafts are placed in Impco five-station micro-finishing machines, such as the one seen in Fig. 16. Here all the main and pin bearing surfaces, as well as the side walls of the No. 3 main bearing are polished, and the oil-seal surface is knurled and polished. Emery cloth of 240 grain size and polishing shoes are employed to remove approximately 0.0005 inch of stock from the various surfaces. Diameters of the main bearing surfaces are maintained between 2.4995 and 2.5005 inches, while pin bearing diameters are held to between 2.1240 and 2.1250 inches.

The crankshafts are then washed, rinsed, and blown off prior to final inspection on Sheffield multiple-column Precisionaire gaging fixtures similar to those previously described and illustrated in Fig. 14. Next the work-pieces are automatically loaded into the twelve-station machine shown in Fig. 17. As the crankshafts enter the machine from the left, they pass through an electric coil and are demagnetized. At various stations in the machine, rotating nylon-fill brushes are fed into the oil-holes, and then the holes are flushed out with oil. From the unloading station, the crankshafts are conveyed to the final assembly line or storage areas.

Accurate Punching Controlled from Cardboard Template



Precision punching is done on steel "cards," used as information translators for long-distance dial telephone systems, by means of special presses which have built-in features to automatically control the accuracy and which employ cardboard templates to indicate where punching is to be done

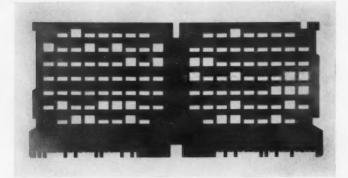
By CHARLES H. WICK Associate Editor

ITH the latest long-distance dial telephone equipment developed by Bell Telephone Laboratories, "card translators" determine the best routing for calls quickly and automatically. This is done at each of the many control switching points through which the calls pass, and requires converting the digits dialed into routing information.

Information for each conversion is contained on a steel card in the card translator. When a call comes in, the dial system selects the appropriate card, and then "reads" the routing information by means of light beams and photo-transistors in a translator. Should the preferred route be in use, the system automatically selects an alternate route.

A typical card used in the translators is shown in Fig. 1. The cards are made of S A E 1008 cold-rolled steel, 0.007 inch thick, which is plated first with nickel and then with chromium for wear resistance and to prevent galling when subjected to the vertical reciprocating motion in the translator. Each blanked card, before coding, contains 118 rectangular holes, 0.375 inch long by 0.140

Fig. 1. Coding holes and notches are punched in a steel card for use in routing calls on longdistance dial telephone systems.



inch high, and 40 tabs, 0.125 inch wide by 0.205 inch long, at the lower edge, from which all the required combinations of routing information can be provided. In coding, the routing information is registered on the cards by enlarging the corresponding holes to a height of 0.310 inch and cutting off the corresponding tabs. The holes enlarged represent the routing information, and the tabs removed determine the selection of the card.

Each control switching station requires about 1000 coded cards for each translator unit as routing equipment. These cards must be kept up to date when new switching points are added or routing patterns are changed to improve service. It is desirable to code the cards at the control switching stations. However, in order to avoid the need for a skilled operator at each location, Bell Laboratories engineers designed the special

punch press seen in the heading illustration. This hydraulic press can be operated by telephone personnel who have had no direct experience with punch presses, as the punch locations are indicated by cardboard templates, and special features in the press automatically insure the necessary accuracy. New cards are quickly and easily punched with the latest information to replace out-of-date cards.

The cardboard templates are printed and perforated at a central point before being distributed to the various control switching stations. Here the personnel punch out by hand the required number of pre-perforated round holes, as seen in Fig. 2, and put in certain notches along the lower edge of the cardboard template, as tabulated on forms listing pre-calculated selection information in code.

The table of the special punch press is provided



Fig. 2. Specified number of preperforated round holes in cardboard template are punched out by hand in accordance with tabulated routing information.

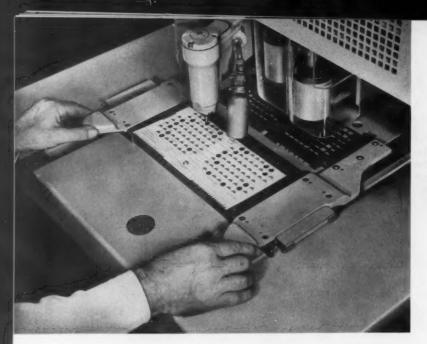


Fig. 3. Carriage of special press, equipped with holders for the cardboard template (center) and the steel card directly behind it, is moved into position for punching.

with an anti-friction bearing carriage, which can be moved by hand to either side or to the front or back of the table. A holder for the cardboard template is mounted at the front of the carriage, and directly behind it is a holder for the steel card to be coded. When a prepared cardboard template is placed in its holder, the upper edge of the template is slid under a steel guide on the carriage and a hole near the front edge of the card is fitted over a locating pin, as shown in Fig. 3.

The pre-blanked steel card to be coded is placed in its holder on the press carriage, locating from notches in the side of the card between a pair of jaws. The relative location of the round holes in the template holder and the corresponding rectangular holes in the card is accurately maintained by two fixed arms having handles used by the operator to manipulate the carriage. The same spacing is fixed between the center of a pilot-pin, seen at the left in Fig. 4, and a hole-enlarging punch, shown directly behind it. The cardboard-template holder is fitted with hardened and ground steel drill bushings from which the carriage is located by the pilot-pin when it is lowered through the punched holes in the template by means of a foot-pedal controlled hydraulic cylinder.

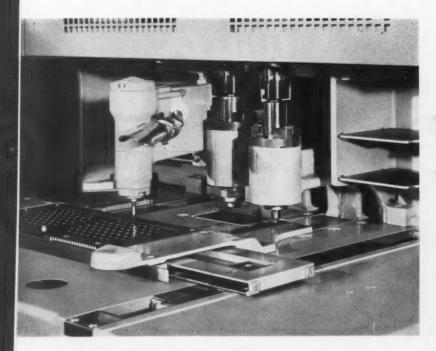


Fig. 4. Drill bushings in cardboard-template holder (lower left) receive pilot-pin when it is lowered through punched holes in template by a hydraulic cylinder.

A selector handle, located below the table at the right-hand side of the operator, determines whether the press will function for hole enlarging or for tab clipping. For hole enlarging, the operator positions this handle and then moves the carriage to bring the pilot-pin over one of the punched holes in the cardboard template. The foot-pedal is then depressed to actuate the hydraulic cylinder that lowers the pilot-pin through the hole in the template and into the drill bushing. Simultaneously, the carriage is automatically positioned so that the corresponding rectangular hole in the card is below the punch.

The piston lowering the pilot closes a microswitch just before the end of its stroke to energize the solenoid valve which directs the oil pressure to the hydraulic cylinder actuating the punch. This causes the punch to descend and enter a die, enlarging the rectangular hole in the card to the required size. A pilot on the end of the tungsten-carbide tipped punch enters the hole first to insure accurate alignment. The die is also of tungsten-carbide. Oil pressure in the punch cylinder is automatically released by deenergizing the solenoid valve just before the end of the punching stroke. In this manner, the punch is quickly returned by coil springs within the punch cylinder.

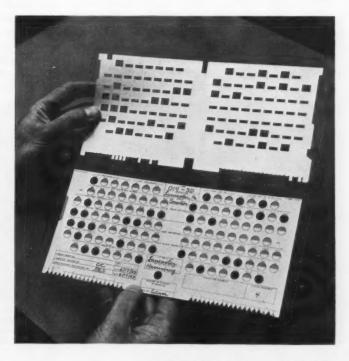
When the required number of holes have been punched in the card with the carriage against the rear stops, the selector handle is moved over to the tab-clipping position. This automatically locks the carriage so that it can move only par-

allel to the row of tabs on the card, raises the stylus which locates the carriage at the desired tab-clipping position, and sets a selector valve to direct oil pressure to the cylinder that actuates the stylus when the foot-pedal is operated. Thus, by aligning the notches in the card template successively with the stylus, operation of the foot-pedal positions the carriage and actuates the tab-clipping punch in the same manner as the hole-enlarging punch. A completely coded steel card and the cardboard template from which it was made are shown in Fig. 5.

Both the hole-enlarging and the tab-clipping cylinders are operated by oil at a pressure up to 350 pounds per square inch, while those for the pilot-pin and stylus operate at a foot-pedal cylinder pressure of about 5 to 10 pounds per square inch. The high pressure is obtained by a rotary pump driven by a 1/4-H.P. motor.

The punches and dies are made with a clearance of only 0.00015 to 0.00020 inch, and produce edges with no appreciable burr. The punches and dies are pre-aligned as units, and are of the quick-change type, so that they can be replaced in about ten minutes. Approximately 3000 to 5000 cards can be punched before the tools need to be reconditioned. A transparent plastic guard is provided around the punches for safety, and a key-operated lock is furnished to shut off power and lock the carriage when the tool is not in use. Two shelves are provided on each side of the tooling area for convenient storage of the cards and templates.

Fig. 5. Enlarged holes and tabs cut away from steel card (top) are compared with holes and notches that have been previously punched or clipped in the cardboard template (bottom).



Knowledge of Decarburization Dangers Safeguards Tool and Die Performance

MAKERS and users of tools and dies are constantly running into trouble from decarburization of tool steels. This trouble and expense can be avoided by an adequate understanding of decarburization and its possible dangers.

A decarburized surface is one that is lower in carbon content than the steel underneath. There are two principal types of decarburization. One is the thin layer of decarburized material, often called bark, that appears on the surface of all hot-rolled, forged, and cold-drawn tool-steel bars. The other is a surface condition of tools and dies resulting from heat-treatment.

Decarburization can easily be detected on the surfaces of hot-rolled bars and forgings, appearing as a thin layer of scale. It is a little harder to detect on cold-drawn bars because their finish is brighter and cleaner. However, it exists to almost the same degree as on hot-rolled bars. Regardless of how a bar looks to the naked eye, decarburization can be easily recognized under a microscope, as seen in the photomicrograph Fig. 1. The degree to which a bar can be decarburized depends somewhat upon the analysis of the steel; some grades decarburize more readily than others.

How to Remove Decarburized Surfaces

The difference in carbon on the surface and that inside a bar is usually enough to cause cracking or warping in hardening operations, no matter what the grade of steel. To get maximum performance from a tool or die, it is necessary that the full carbon content extend to the surface. The photomicrograph Fig. 2 shows a bar that is not decarburized.

The question is often asked: How much stock should be removed from hot-rolled, cold-drawn, or forged bars to eliminate decarburization? In general, the following machining allowances represent safe practice:

Diameter of Bar Stock Re	emoval
Up to 1/2 inch	inch
1/2 inch to 11/4 inches	inch
11/4 to 3 inches	inch
3 to 5 inches	inch
Over 5 inches 3/16	

With rectangular stock, when the width is equal to or greater than four times the thickness, twice the recommended machining allowances should be used. Failure to remove decarburized layers equally from all sides of a bar is inviting trouble, even though some surfaces do not require full hardness. As previously mentioned, cracking or excessive warpage is likely. In tests at Carpenter Steel Co.'s metallurgical laboratory, two specimens each of three tool steels were investigated. The specimens measured 2 1/2 inches by 1/2 inch by 6 inches.

One specimen of each type of steel was prepared for the test by machining 1/32 inch of stock from all four sides. The other specimen from the same bar was prepared by removing 1/32 inch of stock from each of the two narrow

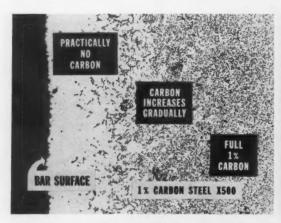


Fig. 1. Photomicrograph of a hot-rolled tool-steel bar which shows decarburization to a depth of approximately 0.005 inch along the left-hand side

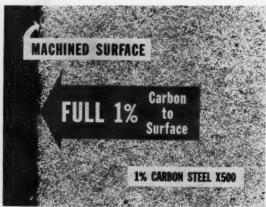


Fig. 2. Photomicrograph of a hot-rolled tool-steel bar that shows full carbon to the edge of the specimen after removing decarburized area by machining

Steel	Four Sides of Specimen Machined				Three Sides of Specimen Machined		
A0.001	to 0.0015	inch	out-of-straightness0.007	to	0.008	inch	out-of-straightness
B0.001	to 0.0015	inch	out-of-straightness0.004	to	0.005	inch	out-of-straightness
C0.0008	to 0.001	inch	out-of-straightness0.006	to	0.007	inch	out-of-straightness

sides, and 1/16 inch from one of the wide sides. The second wide side retained the original bar surface. All specimens now measured exactly 2 7/16 inches by 7/16 inch by 6 inches.

These test sections were placed on their narrow edges in a furnace for heat-treatment, and held in a vertical position during the oil quench. They were carefully measured before and after heat-treating. The results of the test, shown in the accompanying table, indicate the differences in out-of-straightness.

It is not to be inferred that a tool machined on all sides will not warp more than here indicated, because other factors exert an influence. Unequal heating; the position of the tool in the furnace; the condition of the furnace hearth; the quantity of material in the furnace; and the method of quenching—all are factors that influence warping. Having taken precaution in the test to minimize these variables, it is believed that the excessive warpage shown in the second column of the table was caused entirely by the fact that the original bar surface was not removed from one face of the specimens.

There are generally two reasons why tool-makers fail to correct decarburization of work-pieces: (1) Occasionally a toolmaker may decide not to eliminate bar decarburization in an effort to save machining time. (2) He may frequently start with a bar of the same size as required in the finished die, so that no material can be removed. A good rule to follow is to use the next larger standard bar size available, so that the surface of the bar can be properly cleaned up.

Decarburization during Heat-Treatment

Premature wear, cracking, or fatigue failure of tools and dies in service are often traced directly to decarburization that took place in the hardening process. Unfortunately, decarburized surfaces cannot always be removed from a hardened tool or die. Fig. 3 shows a blanking die with holes of such an irregular profile that it is difficult to finish-grind them. The cutting edges will always be low in carbon, no matter how much is ground off the face of the die. This condition will cause a burr on the stamping after

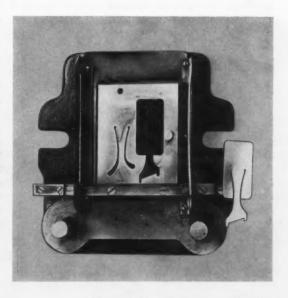
Fig. 3. Blanking die with decarburized edges in the contoured holes which could not be removed because of grinding difficulties

a short time in service because the cutting edges become rounded instead of remaining square and sharp.

In heat-treating tools and dies, decarburization can definitely be prevented by using correct atmospheres and freely circulating the atmosphere through the furnace and work, by using salt baths kept at proper strength, or by employing other types of heating equipment that are kept in good working order. Heat-treating equipment should be checked periodically to insure correct operating conditions.

Proper and improper positioning of a die part to obtain a good circulation of furnace atmosphere are shown at the right and left, respectively, in Fig. 4. It will be noted that the interior surface of the die member, acid-etched for analysis purposes, is dark toward the top in the left-hand view and silvery throughout the bottom two-thirds of the part. The silvery surface indicates decarburization. When the die was placed upright, as shown at the left, the furnace atmosphere could only circulate in the part at the top, and therefore the upper portion of the hole was the only area that hardened free of decarburization. When a similar die was laid on its side, as shown at the right, the furnace atmosphere could circulate readily through the hole and thus produce a properly hardened die part.

Sometimes the hardening procedure reverses itself and the tool takes on a carburized skin.



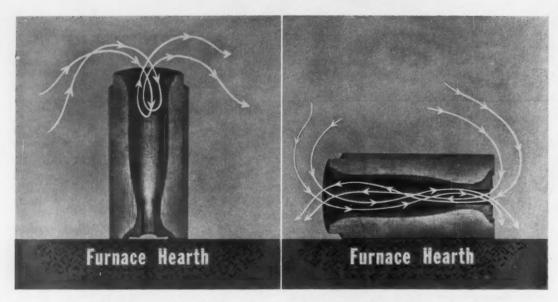


Fig. 4. (Right) Proper method of placing a die in a furnace to insure good circulation of atmosphere. (Left) Method of positioning the die in a way that results in incomplete circulation of atmosphere

This condition can be troublesome too. It may be caused by improper furnace atmospheres or by carburizing compounds left from previous carburizing. Cracking or excessive warpage may also result from this condition. It can also produce a tool susceptible to grinding cracks. Furthermore, the cutting edge of a tool that has a carburized surface tends to be brittle, and hence subject to chipping and spalling.

Typical effects produced by decarburized surfaces are illustrated by the following examples. In Fig. 5 is shown a half section of a circular coining ring, the throat of which is pitted at the top and bottom. This part was hardened in an open gas-fired furnace that did not have an atmosphere control, and the die could not be finish-ground because of its shape

and design. Even though a decarburization of only 0.004 inch in depth was produced, this was sufficient to cause premature wear. In heat-treating subsequent parts, the toolmaker resorted to packing the ring in cast-iron chips; this solved the pitting problem.

In Fig. 6 is shown a chuck jaw that had been hardened successfully in quantities until this particular example was heat-treated. This jaw cracked along the base and up over the tapered body. A laboratory examination indicated perfect grain size but a section of decarburization, 0.025 inch in depth, on all surfaces that had developed during heat-treating. Investigation of the heat-treating equipment disclosed a cracked manometer tube on the air-gas ratio panel so that erroneous readings were obtained.

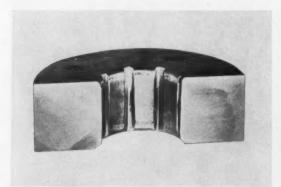


Fig. 5. Circular coining die that is pitted at the top and bottom of the throat as a result of decarburization which occurred in heat-treatment

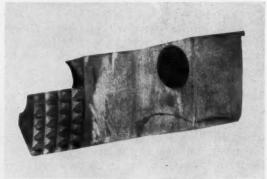


Fig. 6. Chuck jaw that has a severe crack as a result of decarburization to depth of 0.025 inch on all surfaces, which occurred in heat-treatment

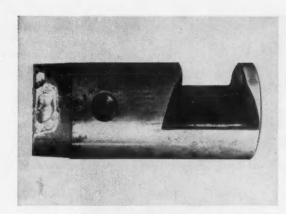


Fig. 7. Clutch dog which has a flaked or spalled area on the tapered end that resulted from decarburization

A clutch dog made from manganese-chromiummolybdenum air-hardening tool steel is shown in Fig. 7. The greater portion of the cylindrical surface on this tool and the slot are normally ground after heat-treatment. However, the short taper at the left-hand end is not ground, and on this section of the particular sample shown, flaking occurred when the clutch dog was placed in service. When sections of this end, cut out of the spalled area, were inspected, the microscope showed decarburization to a depth of 0.018 inch. This was enough to cause a peening action during the initial stages of service, and eventually these cold-worked areas flaked or spalled. The trouble would not have occurred if the part had been heat-treated in such a manner as to be free of decarburization.

Grinding Wheel Formulation Computed Electronically

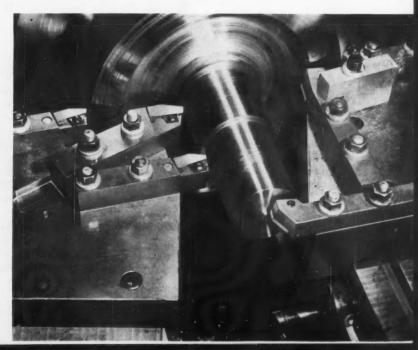
Electronic computing equipment has been linked with a punch card system to calculate automatically the manufacturing formulas for all grinding wheels produced by the Bay State Abrasive Products Co., Westboro, Mass. Called "Electronic Formulation," the process is believed to be the first in the industry.

This new system calculates in seconds as many grinding wheel specification formulas as a complete department could produce in a day. Also, these calculations are performed with a consistent accuracy beyond human capacity. The formulas tell the factory the proportion of ingredients that will be needed to make wheels which will match specifications.

The first steps in the establishment of the program were taken at the Harvard University Computation Laboratory, where thousands of man-hours of calculation work were performed in the space of only one and one-half hours. By the use of this equipment, every increment in grinding wheel hardness and abrasive grain concentration was calculated.

Every card carrying the important "constant" data is kept on file so that all succeeding orders for grinding wheels will be formulated exactly as before. According to the Bay State management, it will not be too far in the future when similar electronic computing systems will be applied to the manufacturing processes with the actual ingredients of abrasive products being physically selected, measured, combined, and processed into grinding wheels.

A simplified quick-change tooling method for the efficient removal of stock from rough forgings has been announced by Kennametal, Inc., Latrobe, Pa. Conventional tool-blocks are eliminated by bolting mechanically held carbidetipped tool-holders directly to riser plates on the machine carriage. For rapid change-over from one work-piece, or operation, to another on the same machine, the entire riser plate with positioned tools may be removed by loosening four bolts.





"Gerac"—A New Method of Gear Finishing

A high degree of accuracy and uniformity can be obtained in the manufacture of gears by utilizing the "Gerac" metal-cutting process. Both spur and helical gears, as well as involute splines, can be economically finished by this method

By Fred Bohle
Manager, Machine Development Division
Illinois Tool Works
Chicago, Ill.

NEW method of finishing gear teeth to improve their surface quality, accuracy, and running characteristics has been developed by the Illinois Tool Works, Chicago, Ill. Called "Gerac," this process can be applied regardless of whether the teeth were formed by hobbing, shaping, or almost any other method. Cutting is accomplished at a relatively large crossed-axis angle, such as 45 degrees.

The construction and function of the new type cutting tool can be readily understood. If a spur gear, for example, were to run in engagement with a 45-degree helical gear at a 45-degree crossed-axis setting, their momentary contact would be in the form of a point. As the teeth go

through a full cycle of engagement, a succession of these contact points will form a curved trace. This trace represents the line along which the cutter is sharpened, as illustrated in Fig. 1. Any gear that is sharpened along this line becomes a cutter having both natural clearance and a cutting face located at an angle of 90 degrees to the chip flow. It is the correct line of sharpening for finishing all gears of the same pitch and pressure angle, regardless of the number of teeth.

The succession of contact points, shown in the illustration, forms the correct line of sharpening for one side of the cutter tooth and one direction of rotation only. If rotation is reversed, the con-

tact trace on the other side of the cutter tooth will also be reversed. In other words, the contours of the two lines of sharpening are alike, but inclined in opposite directions. Because of this, both cutting edges cannot exist on the same cutter face simultaneously.

In the new system, two separate cutters are employed (Fig. 2). Only one cutter is in engagement at a time, as shown in the heading illustration, the other being positioned either above or below center and out of contact with the work. After finishing the tooth flanks on one side, the rotation of the machine is reversed and the other cutter is brought into play to complete the opposite tooth flanks.

A diagrammatic representation of the operating cycle for completely finishing a gear is presented in Fig. 3. This cycle is not necessitated by the design of the tool alone—it is just as essential from the functioning standpoint of this new machine tool.

As can be seen in the illustration, a rapid feed advances the gear to cutter No. 1. At this point, the normal rate of feed is applied while the cutter finishes the lower flank of the gear teeth. When the cut is completed, the work is moved on quickly until it is clear of the cutters. After cutter No. 2 is brought into position, the rotation of both the work- and the cutter-spindle is reversed, the work is fed rapidly to the cutter, and the normal feed rate begun. During this pass of the work, the opposite flanks of the gear teeth

are finished. The direction of travel of the gear is then reversed, and it is quickly returned to the starting position for unloading.

Two separate forces are working on the tool during every metal-cutting operation. One acts with the cut, and the other perpendicular to it. In this system, the work- and the cutter-spindle are connected by a gear train rotating in a timed relationship that is dictated by the number of teeth on both the gear to be finished and on the cutter. The gear train is designed to back the tool against the forces that try to separate it from the work during the cut.

There are two characteristics of the work- and cutter-spindle drives in the "Gerac" machine, Fig. 4. First, relative rotation between the cutter and the work is timed as though the cutting edges were driving the gear; and second, the power input is always at the work-spindle, all other shafts being driven by that spindle. From this it becomes clear that both sides of the gear teeth cannot be cut simultaneously, and that rotation must be reversed between cuts.

The basis of gear design is the involute. In helical gears, the tooth surfaces are involute helicoids. Frequently, in modern gear engineering, deliberate deviations from these theoretically correct forms are introduced. Some of these deviations may be in anticipation of slight non-parallelism of the gear axes, deflection under load, or physical changes that may occur as a result of heat-treatment. Alterations in

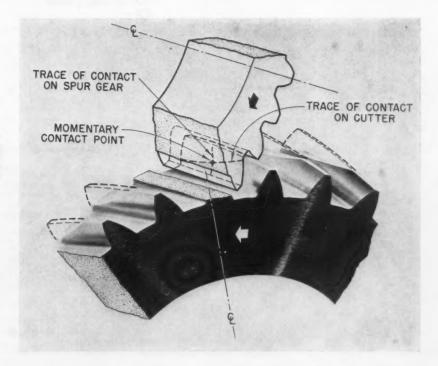
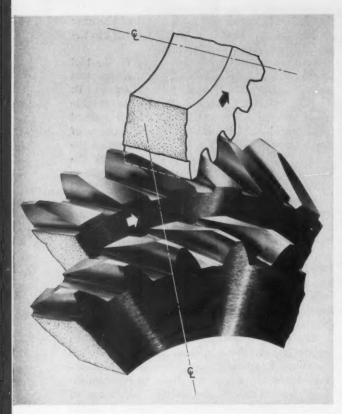


Fig. 1. A trace is formed on the cutter teeth by their contact with the gear. It is along this line that each cutter tooth is sharpened.



tooth contours may be in the direction of crowning, in the plus or minus direction from the theoretical lead or involute, or both.

In this finishing system, control of the tooth profile is in the hands of the operator. The lead of helical gears and the parallelism of spur gears are prescribed by a guide located on the workspindle. The desired amount of crown is incorporated in the lead groove of the guide, and is duplicated on all gear teeth. Small lead variations, in either the plus or minus direction, can be introduced by adjusting the lead groove.

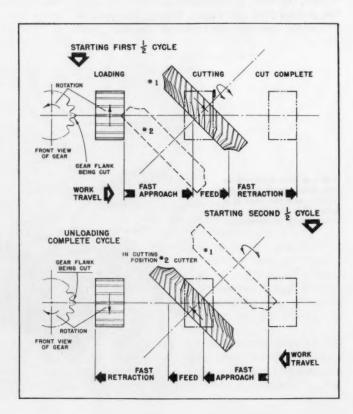
Effective control in the radial direction—that is, over the involutes—can be maintained during cutter sharpening, which is a simple cylindrical grinding operation, Fig. 5. The grinding wheel can be formed by the use of either a standard radius-dressing fixture or a simple grinding template. Though they operate in pairs, the cutters need not be sharpened to critical tolerances.

The line of contact shown in Fig. 1 is for a true involute. In practice, however, this contact line is approximated by a radius, the size and center location of which are selected to provide the desired tooth modifications. The profile of the cutter is shown being checked on an optical comparator in Fig. 6.

Cutters supplied with a true matching helix

Fig. 2. (Above) Two separate cutters are employed. One finishes the flank on one side of the tooth, and the other finishes the opposite tooth flank.

Fig. 3. (Right) The work is fed from left to right as cutter No. 1 finishes the lower tooth flanks. After reversal of the machine rotation, the work is fed from right to left as cutter No. 2 finishes the opposite tooth flanks.



in the 45-degree crossed-axis position will have natural clearance. The helix angle may be increased to obtain additional side clearance. Sharpening away from the theoretical contact line produces involute variations that are proportional to the tangent of the side clearance angle. With a cutter having a side clearance angle of 2 degrees, a 0.0005 inch involute change will result in a movement in the sharpening line

of $\frac{0.0005}{0.035}$, or 0.014 inch. Although this is a sub-

stantial amount, it indicates that sharpening is not necessarily a delicate operation. A 0.002 inch error in sharpening will cause an involute error of only 0.00008 inch.

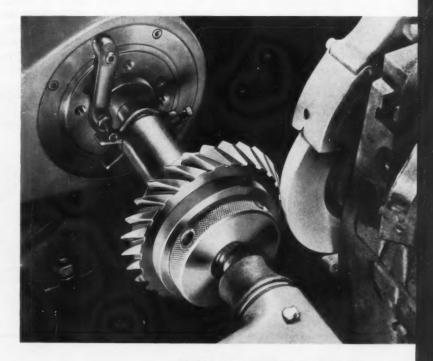
As a result of this finishing process, gear tooth surfaces have a cut rather than a burnished appearance. Surface smoothness of the teeth depends on the rate of feed—the more deliberate the rate, the finer the finish. A diagram of the feed marks produced while finishing a helical gear is shown in Fig 7. As in the case of the sharpening line of the cutter, the feed pattern follows the path of contact. The feed path resulting from the finishing of a spur gear is illustrated in Fig. 8.

Cutting speeds recommended for this process are typical of those used when any light, interrupted finishing cuts are taken. As in all metalcutting operations, cutting speed is a compro-



Fig. 4. (Above) In the "Gerac" machine, power input is at the workspindle. A gear train connects this spindle to the cutter-spindle, so that both are power-driven.

Fig. 5. (Right) Sharpening of the cutters is a simple cylindrical grinding operation. Either a template or a standard radius-dressing fixture can be used to shape the grinding wheel.



MACHINERY, January, 1956-145

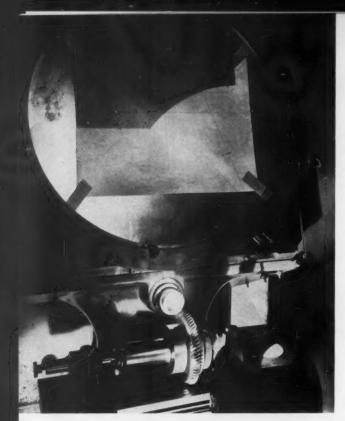


Fig. 6. An optical comparator is used to check the ground contact line of a cutter tooth. In practice, this contact line is in the form of α radius.

ing a gear 1 1/4 inches wide having a 4-inch pitch diameter would be as follows:

Cutting Time-Forward:

$$\frac{1\,1/4'' \; (\text{width of gear}) \,+\, 1/4'' \; (\text{overlap})}{5'' \; (\text{feed per minute})} = \\ \frac{1.5}{5} = 0.3 \; \text{minute}$$

Cutting Time-Back:

$$\frac{1.5}{5}$$
 = 0.3 minute

Industry-Sponsored Scholarship Program
Enters Its Second Year

A scholarship program sponsored by the General Motors Corporation, Detroit, Mich., is entering its second year. Plans have been made to allow an additional 350 young men and women to enter college in the fall. The scholarships will be furnished under a new program of expanded financial support to higher education. A total of 306 colleges and universities are presently receiving benefits under this program. Registration for the second year of the scholarship plan is now under way.

mise between the length of the operating cycle and the factors of tool life and machine vibration. At present, the speed range found to give the best results is from 200 to 400 feet per minute, pitch-line velocity.

Tests have shown that finishes equal to those obtained by shaving can be realized at feed rates of approximately 0.020 inch per revolution of the cutter. With the machine feeding at this rate, and with both the work and the cutter turning at a speed of 250 R.P.M., the feed per minute will be 5 inches. Therefore, the cycle time for finish-

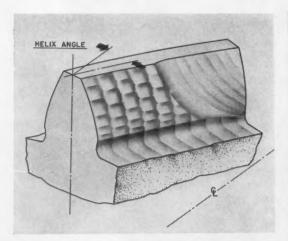


Fig. 7. This diagram indicates the kind of feed marks produced when finishing the flank of a helical gear tooth.

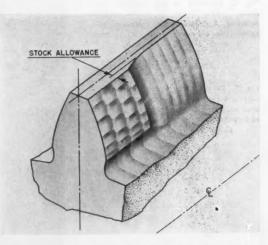


Fig. 8. The feed marks seen here were produced during finishing operation on the flank of a spur gear tooth.



Axle Production Doubled with Automatic Cycling Lathes

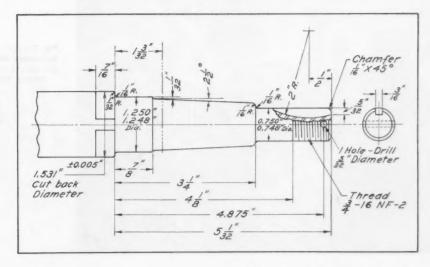
RODUCTION has been more than doubled and costs greatly reduced in turning the ends of trailer axles at the Hadco Engineering Co., Huntington Park, Calif. This has been accomplished by using Axelson heavy-duty lathes equipped with electronic controls and hydraulic power units for automatic cycling and speed changing.

The lathes, such as the one seen in the head-

ing illustration, are used to turn the ends of five different size axles for trailers of all types. One end of a typical axle, made from 1 1/2-inch square S A E 1045 steel bar stock, is shown in Fig. 1. Using two lathes, both ends of 100 or more axles can be contour-turned and threaded in a nine-hour working day.

The operator need only load and unload the lathes and advance the threading tools manually.

Fig. 1. One end of a typical trailer axle, made from 1 1/2-inch square steel bar stock, is contour-turned and threaded on the lathe illustrated in Fig. 2.



A foot-controlled, air-operated elevator raises the axles to spindle height, thus reducing fatigue of the operator by eliminating the handling and lifting of large numbers of work-pieces. Also, swinging of the axles end for end in the lathe is facilitated by the provision of a swivel top on the elevator.

Hydraulically operated collets, each equipped with eight pads, are provided on both ends of the spindle for gripping the square bar stock when a single control lever on the headstock is operated. Then the automatic cycle of the lathe is started by pressing a button. This causes the cross-slide to automatically move forward to a stop, after which the carriage advances to rough-contourturn all the required surfaces on one end of the axle.

When the carriage returns, the cross-slide automatically shifts until it comes in contact with a second stop, which aligns the box type turning tools with the work. The carriage then advances to finish-turn the straight bearing surface on the axle to the required size. After the carriage returns, the spindle speed is automatically reduced from 1150 to 175 R.P.M. for threading, the cross-slide moves to a central position, and the threading die head is advanced manually. At the completion of the threading operation, Fig. 2, the operator breaks the sharp corners on the work-piece with a hand file, stops the machine, and inspects the bearing surfaces and threads.

Grade 370 Carboloy is used for the contour

and box type turning tools, while the threading dies are of high-speed steel. The tools are interchangeable on the two machines. Both roughand finish-turning operations are performed at a feed of 0.015 inch per revolution. Actual machining time is only 1 1/2 minutes per axle end.

Production of trailer axles at this plant is further speeded by efficient methods of handling material and performing the machining operations. For example, square steel bar stock is purchased in suitable lengths to facilitate cutting and minimize waste. Complete bundles of bars (consisting of up to sixty pieces per bundle) are placed on the loading table of the DoAll hydraulically controlled, automatic, power cut-off machine (Fig. 3) for simultaneous cutting to the required lengths. The bundles weigh up to 5 tons each, and are advanced to the cut-off machine by push-button controlled, power-operated rollers on the loading table. Gasoline-powered lifttrucks are used to carry the cut bars to stock support racks specially designed to suit the loading height of subsequent machines.

After contour-turning and threading on the automatic cycling lathes, a keyway 3/16 inch square by 1 1/4 inches long is milled, and a cotter-pin hole 5/32 inch in diameter is drilled in each end of the trailer axle. Both operations are performed simultaneously on the special machine shown in Fig. 4. The operator need only load and unload this machine, clamping of the work-piece being done by air power. A single

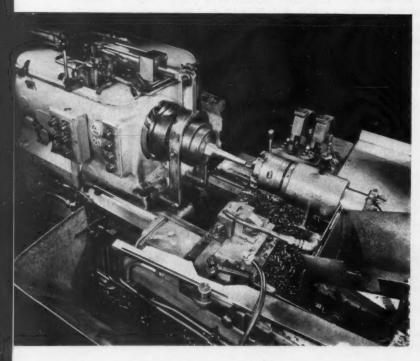


Fig. 2. Close-up view of lathe seen in heading illustration. At this point, one end of the trailer axle has been contour-turned and threaded.

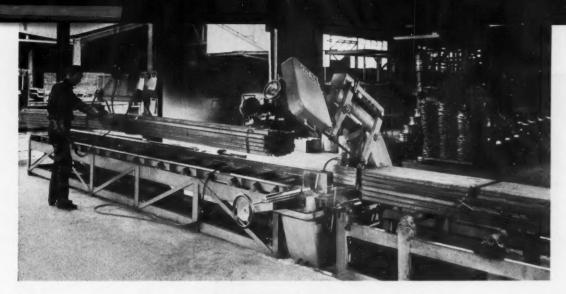


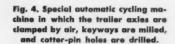
Fig. 3. Square steel bar stock, purchased in bundles, is cut to required lengths on this hydraulically controlled, automatic, power cut-off machine.

lever movement starts the automatic cycle of the machine. Also, a foot-controlled, air-operated elevator having a swivel top facilitates aligning the axles on the machine and swinging them end for end. On this machine, one operator can complete approximately 225 axles per day, including running a nut on both ends of each axle.

In preparation for offset forming of the trailer axles, both ends are selectively heated simultaneously by means of the set-up illustrated in Fig. 5. For this purpose, two Thermonic in-

duction heating units are employed, and the axle ends are inserted in coils attached to the units. Axles made from 1 1/2-, 1 3/4-, 2-, and 2 1/4-inch square stock can all be heated in the same set-up. One operator takes care of both heating and offset bending, 2 1/2 minutes being required to heat and bend both ends of one axle.

Offset forming is performed on the hydraulic bending machine seen in Fig. 6. The forming dies on this machine are interchangeable to accommodate various sized axles and to make off-





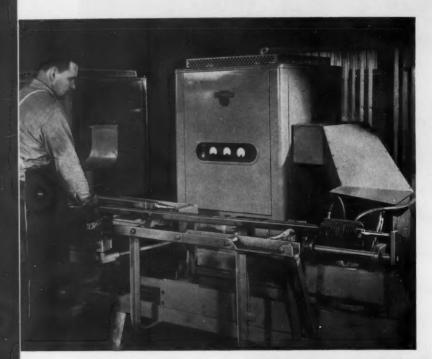
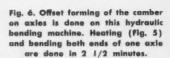
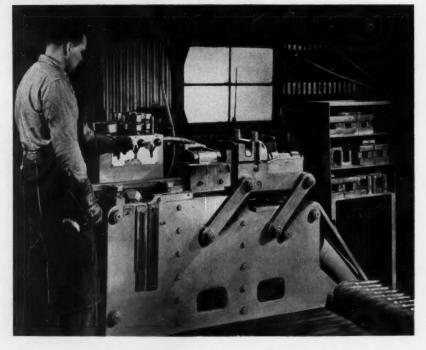


Fig. 5. Two induction heating units are employed to heat both ends of trailer axle simultaneously in preparation for offset forming.





sets of from 2 to 6 inches on each size workpiece. Three levers on the machine control the clamping, bending, and ejecting of the axle. Location during bending is from the finish-machined bearing surfaces. A 1 1/2-degree camber is formed in the axle during bending. The bending operation is completed in from twenty-five to thirty seconds.

Galvanized Sheet and Strip Production

Current production capacity of galvanized sheet and strip steel is in excess of 3,300,000 net tons. More than half of the galvanizing is done in continuous hot-dip lines. Within another year, these lines will account for more than three-fourths of the capacity.

Automatic Milling Machine Built Around Indexing Table

SPECIAL-PURPOSE efficiency and generalpurpose adaptability form an invaluable partnership in an automatic milling machine made by the Producto Machine Co., Bridgeport, Conn. Basic elements of this machine, termed "Index Mill-Matic," are a round indexing table that carries the work-fixture, and a vertical slide on which a cutter-head is mounted. Table and slide movements are actuated hydraulically and are tied together. In addition to its indexing movement, the table, like the slide, can execute a rapid approach, feed stroke, and rapid return.

The machine lends itself well to jet-engine manufacture, where index-milling of a variety of circular parts is involved. It also has been found practical for many milling operations when integrated with high-production transfer lines. Two typical applications are here described.

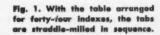
In Fig. 1, forty-four equally spaced tabs are being straddle-milled in the outer turbine seal ring for a jet engine. The material is AMS 5627 stainless steel having a Brinell hardness number of 150 to 185. The tabs, 1/2 inch wide and 3/16 inch deep, must be within 0.001 inch of true an-

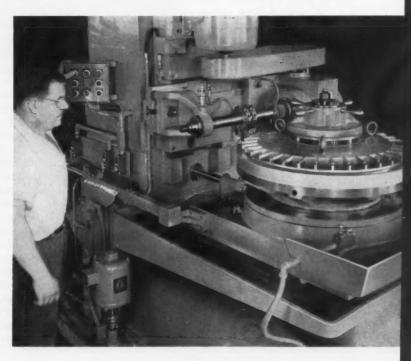
gular position. For securing the ring, the workfixture consists of a series of floating segments which form an internal cone and a hold-down

Mounted on the vertical slide are a spindle drive motor, transmission, and arbor assembly, rotating a pair of 5-inch high-speed steel staggered-tooth cutters at 110 R.P.M.

The table is equipped with an index-plate having forty-four divisions. In the cycle, which is completely automatic, the table rotates one division, rapid traverses to the cutter, feeds, returns, and then repeats the same movements until all tabs have been straddle-milled. The spindle then stops automatically. Floor-to-floor time amounts to twenty-five minutes per ring, the actual machining taking twenty minutes. In contrast, two and one-half hours floor-to-floor time was consumed by a previous milling method.

The second application, Fig. 2, shows an Index Mill-Matic used in an automobile crankshaft processing line. Here the equipment mills a 3/16-by 3/8-inch keyway at one end of the crankshaft and simultaneously presses in a 7/16-inch steel





MACHINERY, January, 1956-151

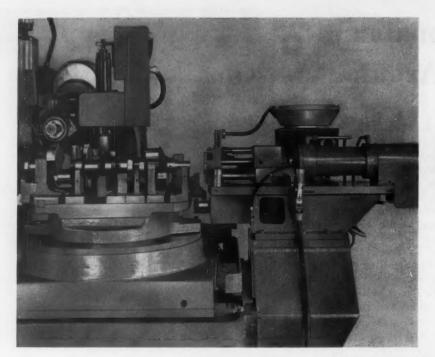


Fig. 2. A two-station index arrangement and a double work-fixture eliminate unloading and reloading time in processing automobile crankshafts.

dowel and a 1 1/8-inch diameter bronze bushing at the opposite end. To mill the keyway, the vertical slide is equipped with a Bridgeport head having its spindle in a horizontal plane and fitted with a 2 1/8-inch high-speed steel cutter. For pressing in the dowel and bushing, the knee of the machine has a hydraulic ram and hopper and chute feeding devices.

The work-fixture accommodates two crank-shafts, and consists of a double row of cradles located next to each other, but running in opposite directions. In this instance, the table index-plate permits two rotational movements of 180 degrees each. Thus, one crankshaft is in the working position while the other is in the loading position. An overhead hydraulic plunger directly above the crankshaft in the working position secures it in its cradle. The frame for this plunger is bolted to one side of the knee.

After a crankshaft is loaded manually, the cycle starts. The table indexes 180 degrees, and the hold-down plunger is actuated. The vertical slide then descends, and the table feeds out. At the same time, a pin and bushing are pressed in. Meanwhile, the operator unloads a completed crankshaft and loads a new one. Next, the vertical slide rises, the hold-down plunger releases, and the table retracts toward the column.

Except for the loading and unloading of the crankshafts, and the occasional loading of the pin hopper and bushing chute, the machine functions automatically. The entire cycle consumes but twenty seconds.

Television Shows Eccentric Loading of Forging Press

Industrial television has been put to a unique use on the massive 35,000-ton forging press in the United States Air Force Heavy Press Plant at the Aluminum Co. of America's Cleveland, Ohio, Works. The television camera is located in the press foundation and keeps watch on a hydraulic mechanism that indicates eccentric loading. The receiver is installed on the operator's portable control station. If the televised picture indicates excessive off-center loading, the press operator is immediately warned.

The complicated shape of some of the forgings produced may cause eccentric loading of the upper and lower platens. The degree of deflection must be measured by the stretching of huge tierods. Such distortion is reflected in the four hydraulic cylinders at each corner of the press. Small hydraulic lines attached to each cylinder are connected to the mechanism viewed by the television camera.

When the press is centrally loaded, a beam of light is focussed in the center of a diamond-shaped gage viewed by the camera. If off-center loading occurs the beam moves from the center toward a border of the diamond, disclosing the location of the load center. Noting this movement, the press operator can prevent damage to the machine by taking corrective action. Should he fail to act quickly enough, all movement is automatically stopped.

All-Inclusive Testing of Tubing at 250 Feet per Minute

SESTING equipment newly installed at the of the Carpenter Steel Co. and the Magnetic its kind for a tube mill, is a joint development If, for example, a set-up is made to inspect Type

Alloy Tube Division of the Carpenter Steel Analysis Corporation, Long Island City, N. Y. Co., Union, N. J., permits non-destructive, 100 In testing tubing by the lot, the equipment per cent inspection of stainless-steel tubing at detects any variations in chemical analysis, wall production speeds. This equipment, the first of thickness, outside diameter, and inside diameter.

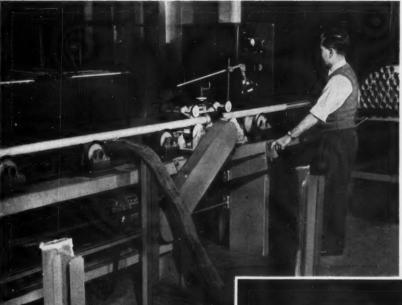
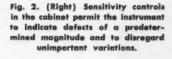
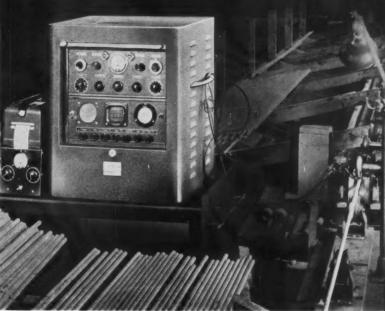


Fig. 1. (Left) While the tubing is driven through a coil at 250 feet per minute, a flashing light and audio signal warn the operator of flaws or discrepancies in the material.





304 tubing, all other types submitted for inspection will be rejected automatically, even though they are identical in size, gage, and over-all appearance. In addition, defects invisible to the eye -including those that cannot be disclosed by a hydrostatic test-as well as carburization or gouging on inside diameters, can be detected.

The equipment consists of an indicator cabinet and a combination tubing drive and coil holder. Coils with various inside diameters are furnished to suit the tubing sizes being inspected. In operation, the tubing is driven through the coil at a high rate of speed. At the Carpenter plant, a speed of 250 feet per minute is maintained. Any flaws or lack of uniformity of dimensions or chemical analysis in the work will produce a flashing light on the panel of a meter chassis in the cabinet.

To assist in locating a trouble spot, an audio

signal operates with the light. This device makes it unnecessary for the operator to watch the light continuously, and also permits a more accurate interpretation of the flaw or discrepancy. Selective circuits enable the instrument to eliminate unimportant variables and indicate only flaws and discrepancies of importance. An oscilloscope in the cabinet is normally used in setting up, but can also be utilized as an indicator.

At present the equipment is being used principally to test welded non-magnetic stainlesssteel tubing of 1/2 inch, or less, outside diameter. However, the set-up is such that tubing with outside diameters from 1/4 to 3 1/4 inches can be inspected. Defects up to 3 per cent of the wall thickness can be detected in walls 0.070 inch thick or less; up to 5 or 6 per cent in walls 0.083 inch thick; and up to 9 or 10 per cent in walls 0.109 inch thick.

Rolling Sheet Metal into Housings for Washing Machines

By HERBERT CHASE

poration operates two huge plants solely for by the concern, as well as a substantial num-

ASHING machines for home laundries manufacturing home laundry equipment. At are among the large production items in the present time, the Clyde, Ohio, division the electrical appliance field. The Whirlpool Cor- makes all the wringer type washers produced

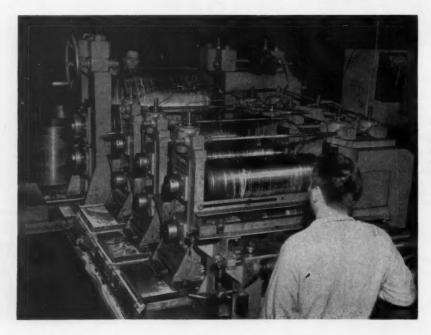


Fig. 1. Four-stand rolling 130 per hou

FIRST ROLLS SECOND ROLLS THIRD ROLLS FINAL ROLLS

Fig. 2. Diagrams showing the contours of the successive pairs of rolls used in forming washing machine housings, cross-sections of the housings being indicated by heavy lines between the rolls

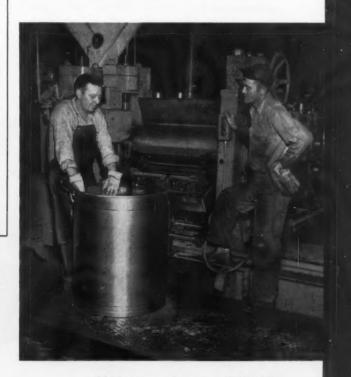
Fig. 3. (Right) Contoured washing machine housing as it appears when lifted from the last stand of rolls, the complete contour and the barrel-like shape being produced by four pairs of rolls

ber of automatic washing machines and ironers.

Outer housings for wringer type washers are called skirts, shells, or shrouds, being shaped somewhat like barrels or drums. They are produced in McKay four-stand rolls of the type shown in Fig. 1. These rolls form a flat blank of sheet steel to the contour required in the longitudinal cross-section of the final shell, as indicated by the diagrams in Fig. 2, which show the contours of the successive pairs of rolls. The last pair also forms the steel sheet into a shell of the required diameter and contour.

In the final shape, as is apparent from Fig. 3, the ends of the housing are slightly smaller in diameter than the central portion, which has a crowned contour. Near the two ends, the sheet metal is stepped and at one end, there are also a bead and a turned-in flange, as indicated by the heavy line in the bottom diagram of Fig. 2. When the washing machine is assembled, the long joint in the side of the housing where the two edges come together is covered by a leg and other attachments.

Besides being pleasing to the eye, a housing of this type has good stiffness. It is low in cost due to economical use of steel and rapid production with minimum labor. From flat blanks fed into the rolls at one end of the machine, the housing comes out at the other end ready for use, except for enameling. Two men load the blanks and remove the formed housings at the rate of approximately 1050 housings in eight hours.



Recommendations for Grinding Titanium with Abrasive-Coated Belts

By Dr. Hugh N. Dyer Director of Product Testing Behr-Manning Division Norton Co., Troy, N. Y.

NLIKE other structural metals, titanium possesses unusual chemical and physical properties which pose certain problems when grinding it with abrasive-coated belts. Titanium is so reactive at the temperatures generated in grinding that the abrasive grains become dulled or flattened rapidly. This is attributable either to their partial solution in, or their chemical reaction with, the hot metal. The dulled grains slide over the surface of the metal, creating additional heat but doing little useful cutting.

Successful grinding of titanium with abrasive-coated belts depends on the reduction of this frictional wear by lowering the temperature at the grinding point and by using grinding fluids that will form a protective film over the freshly cut metal surfaces. Desirable fracture wear, which exposes fresh cutting edges, is promoted by using the correct belt, operated at the optimum speed, in conjunction with the proper contact wheel and grinding fluid.

Recommended Belts and Contact Rolls

Abrasive belts coated with silicon carbide give the best results in grinding and finishing titanium. Paper-backed belts, used either dry or with an oil or grease, are suitable for some flat sheet work. In operations requiring a more rugged belt, cloth backing is used. Synthetic resin bonds provide maximum durability. When water-base grinding fluids are used, waterproof cloth-backed products are necessary. Grits ranging from 40 to 80 are recommended for roughing and spotting operations, while grit 120 or finer is recommended for higher finishes.

Heat build-up, dulling, and glazing are reduced and fracture wear is promoted by using plastic, metal, or hard-rubber contact rolls. These rolls should be of small diameter to provide near-line contact and high unit pressure between the abrasive belt and the work. Flat shoes or platens and soft rolls usually lead to rapid belt failure due to dulling of the abrasive material. However, a soft-rubber roll is used in blending and spotting operations for the removal of small defects in stock, before or after final reduction of the metal.

Low belt speed reduces the temperature at the grinding point, retards reaction between the metal and the abrasive grains, and promotes fracture wear. It also reduces scorching or marring of the surface of the sheet being ground due to accumulations of incandescent chips. When a grinding fluid is used, speeds ranging between 1500 and 2500 surface feet per minute are recommended. For dry grinding, a speed range of between 1000 and 1500 surface feet per minute will give satisfactory results.

Selection of Grinding Fluids

Grinding fluids, in addition to cooling both the wheel and the work and quenching the spark can reduce the reaction between the metal and the abrasive grains. A grinding fluid should always be used when taking continuous cuts over large areas. For interrupted cuts, such as spotting defects in sheets or bars, or offhand grinding of small parts, dry grinding at speeds up to 1500 surface feet per minute will prove satisfactory.

Heavily sulphurized and chlorinated cutting oils work well, and can be used with non-water-proof abrasive-coated belts. Because of the extremely hot spark obtained in titanium grinding, only oils having a high flash point (above 325 degrees F.) should be used. To obtain rapid spark quenching, the fluid should be introduced close to the grinding point. Any exhaust or dust collecting system employed must be designed to minimize the fire hazard.

Although water-base grinding fluids present no fire hazard and are relatively inexpensive, they require the use of waterproof abrasive-coated belts. Conventional soluble oils are poor grinding fluids for titanium, but may sometimes be useful where the alternative is grinding dry at speeds in excess of 1500 surface feet per minute. Rust inhibitors of the nitrite-amine type give good results when used with water. Among the most effective water-base fluids found so far are 5 per cent solutions of either sodium nitrite or barium nitrate. Since all water-soluble barium compounds are poisonous if swallowed, and since contact with eyes or skin should be avoided,

barium nitrate is not recommended for commercial applications.

Information available at the present time on costs of production grinding of titanium with abrasive-coated belts is meager. However, it is estimated that, under good grinding conditions, it will cost approximately six to ten times as much per cubic inch of titanium metal removed as for the same volume of stainless steel.

Improvements and new developments in machine tools using coated abrasives, and also in grinding fluids, will undoubtedly reduce grinding costs in the future. Even at present, abrasive-belt grinding of titanium and its alloys is giving excellent results at costs competitive with other methods of stock removal. All the foregoing recommendations are applicable for grinding commercially pure titanium or its common alloys.

Tool and Die Manufacturers Elect New Officers

EXECUTIVES of the nation's leading contract tool and die shops, at the tenth annual convention of the National Tool & Die Manufacturers Association held recently in Detroit, Mich., elected the officers shown in the illustration. Joseph N. Huser, president of B & H Specialty Co., Inc., Indianapolis, Ind., is the new president of the Association. Other officers elected were: first vice-president, Herbert Harig, president of Harig Mfg. Corporation, Chicago, Ill.; second vice-president, Philip R. Marsilius, vicepresident of Producto Machine Co., Bridgeport, Conn.; and treasurer, Robert C. Renner, president of East Dayton Tool & Die Co., Dayton, Ohio. Harold G. Murdock, vice-president of Arrowsmith Tool & Die Corporation, Los Angeles, Calif., was re-elected secretary.

It was announced that 164 new members had joined the association during the past year, making the total more than one thousand. The members expressed confidence that sales during 1956 would be well ahead of 1955 because of increased purchases, mainly by automotive, television, and aircraft manufacturers. Extensive changes in 1957 cars, and the trend of the automotive industry toward major revisions every two years,

instead of every three years as previously, are major reasons for optimism by the association members.

Optimism of the members was supported by a convention speaker, Martin R. Gainsbrugh, chief economist of the National Industrial Conference Board, New York City. Mr. Gainsbrugh predicted that 1956 could be the best business year on record despite political uncertainties, with the first half of the year resulting in a 2 to 3 per cent increase over the third quarter of 1955, and the second half of 1956 probably maintaining the plateau. Gross national product may reach an all-time high of \$410,000,000,000,000, he added.

Ralph E. Cross, executive vice-president of The Cross Company, Detroit, Mich., also addressed the convention, describing and illustrating interesting examples of Transfer-matics and machine control units in a paper entitled "Modern Techniques in Automatic Production." In reply to a question from the floor, Mr. Cross predicted that automation would be increasingly applied to job-lot production, as the problem created by the present high cost of equipment is overcome.

Officers of the National Tool & Die Manufacturers Association are (seated, left to right): Herbert Harig, first vice-president; Joseph N. Huser, president; and Philip R. Marsilius, second vice-president. Standing: Robert C. Renner, treasurer, and Harold G. Murdock, secretary



Tubing Rolls Accurately Machined on an Engine Lathe

ROLLS required for such operations as the forming of seamed tubing are produced in many shapes by the Toledo Steel Roll Co., Toledo, Ohio. The parts seen in Fig. 1 are typical of the work that goes through this shop.

Much of the turning on such parts is performed on a Tray-Top engine lathe built by the Cincinnati Lathe & Tool Co., Cincinnati, Ohio. The operations necessary to complete the high-

carbon, high-chromium steel roll seen in Fig. 2 consist of turning, facing, boring, and counterboring for bearing pockets within a tolerance of plus or minus 0.001 inch.

The lathe operator is seen in Fig. 3 adjusting the cross-slide feed as the cutting tool begins a pass on the work-piece, which is held by a 15-inch four-jaw independent chuck mounted on the spindle nose. The rate of feed for this operation





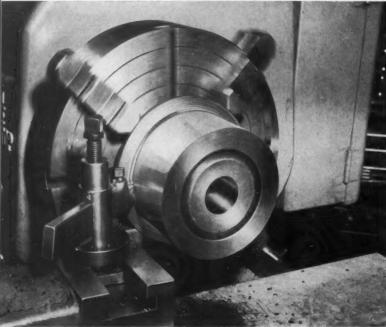


Fig. 2. (Left) Turning operation on high-carbon, high-chromium steel roll which is used to form seamed tubing

Fig. 3. Wide range of speeds and feeds on this lathe has proved advantageous in machining rolls



is 0.015 inch per revolution, and the work rotates at 67 R.P.M.

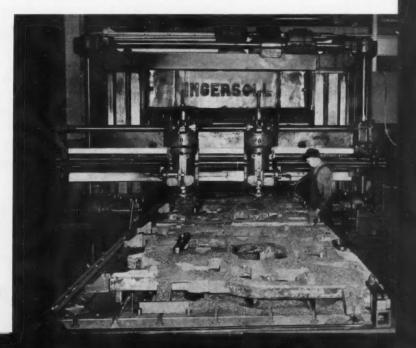
This lathe has a spindle speed range of 24 to 960 R.P.M., and a three-lever, color-matched dial makes shifting to any of twelve spindle speeds easy. The wide range of speeds and feeds adapts the lathe for diversified work.

Surveys have shown that the automobile manufacturers most aggressive in adopting automation have had the highest level of employment in their history during the first quarter of 1955.

New Contract Division Established

A Contract Manufacturing Division has been organized by R. Hoe & Co., Inc., New York City, to expand its activities in special machine design, engineering, and precision-component production. Items manufactured by this division will complement the company's production of newspaper, magazine, and metal-decorating presses; saw equipment; and files. In conjunction with the establishment of this new division, the company has inaugurated a \$1,200,000 expansion and replacement program for the purchase of machine tools, the largest such acquisition in its history.

Machining ink-carriage side frames for printing presses at the Dunellen, N. J., division of R. Hoe & Co., Inc.



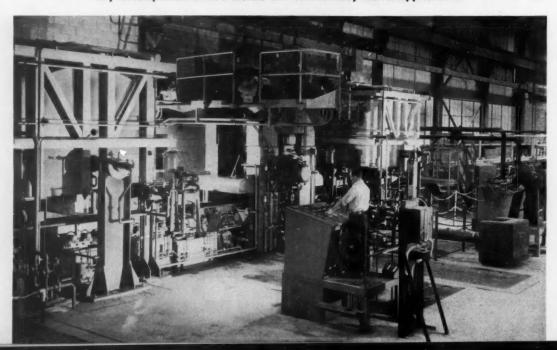


In Shops Around the Country

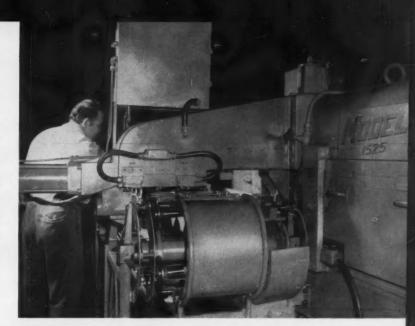
Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

Six-cylinder die-cast aluminum engine blocks, first of their kind, move down a conveyor in the Toledo, Ohio, plant of Doehler-Jarvis Division, National Lead Co. Block weighs 43 pounds when trimmed, as compared with 175 pounds for the same block in gray iron. All holes are cast in, eliminating subsequent drilling. Die-casting machine in background, claimed to be world's largest, produces these blocks on an experimental basis.

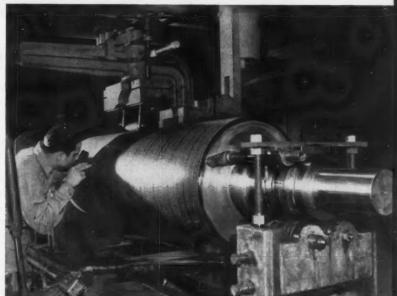
Slabs can be reduced from 8 inches to 0.090 inch in thickness on this Bliss reversible hot-rolling mill at the new metallurgical facility of the Westinghouse Electric Corporation, Blairsville, Pa. An integral roller hearth furnace reheats and holds the material at required temperature. This pilot plant plays a key role in transforming laboratory developments of new metals into commercially useful applications.



Splines are cold-rolled into rearaxle shafts with a 3- to 6-microinch finish at the Ford Motor Co.'s Mound Road plant near Detroit, Mich. Processing is done on Michigan Tool Roto-Flo machines. An average of 11,500 shafts are rolled daily on three machines, with production at 90 per cent efficiency. The forming racks, which produce the spline, have a life of approximately 150,000 parts per grinding.



At the Modern Engraving and Machine Co., Hillside, N. J., a pattern is impressed in the surface of a large embossing roll. One of a mating pair, the roll is a steel forging furnished completely machined by the Standard Steel Works Division, Baldwin-Lima-Hamilton Corporation, Burnham, Pa. Later, roll is heat-treated by an oxy-acety-lene flame ring and quenching jets of water.



Hamilton Standard Division of the United Aircraft Corporation, Windsor Locks, Conn., improves fatigue strength of propeller parts by shot peening at points of greatest stress. Lands and grooves of gear segment illustrated are shot peened in a three and one-half minute automatic cycle in a modified Pangborn blast cabinet.





"Merry-Go-Rounds" Speed Rubber Forming

By Lyle Boarts, Assistant General Foreman and Eugene Searcy, Foreman, Hydro Forming Department North American Aviation, Inc., Los Angeles, Calif.

WO multiple-station "merry-go-rounds," developed to feed dies and work blanks to two rubber-forming presses, are increasing output and reducing operating hazards at North American Aviation, Inc., Los Angeles, Calif. The stations of the merry-go-rounds con-

sist of aluminum pallets on which are positioned the form blocks, or male die members, for various airplane parts. The pallets index in sequence to the pressing position, while personnel at various points next to the merry-go-rounds load or unload the parts. Replacing conventional shuttle

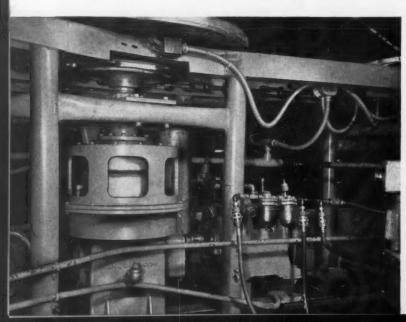


Fig. 1. A sprocket on the shaft of the reduction gear unit of the press merry-go-round drives an endless chain linking each pollet.

Fig. 2. A bar key automatically locks each pallet in alignment with the ram of the press.



tables, the pallets have made possible a decrease of 60 per cent in labor, and at the same time have increased production 10 per cent. In addition, the presses are run from a remote control panel, removing the operators from the dangerous bed area.

In the heading illustration can be seen one of the presses (a 4500-ton Birdsboro) and its merry-go-round. There are ten pallets, made of aluminum and riding on two rows of roller bearings. Since the laminated container for the rubber pad supported by the press ram is cylindrical, the pallets are circular and of a corresponding diameter (42 inches). Progression of the pallets is counter-clockwise.

The close-up view from beneath the merrygo-round, Fig. 1, shows its simple tubular construction and the drive mechanism, consisting of a motor and a reduction gear box. A driving sprocket fixed on the shaft of the reduction gear box meshes with an endless chain to which the bottom of each pallet is linked. Speed of the chain can be varied to produce indexing intervals of two and one-half to eight seconds.

Accurate alignment of each pallet with the press ram is obtained by an electro-pneumatic interlock on the press bed, seen in Fig. 2. To start a forming cycle, the operator depresses a start button, which causes the press ram to descend. On its up stroke, the ram makes contact with a momentary-impulse switch connected to an air cylinder which unlocks a bar key. The return movement of this bar key, in turn, actuates another momentary-impulse switch which energizes the motor for the reduction gear box, and the chain starts moving. When the subsequent

Fig. 3. On the 7000-ton press, the pallets are rectangular to conform with the shape of the container for the rubber pressure pad.



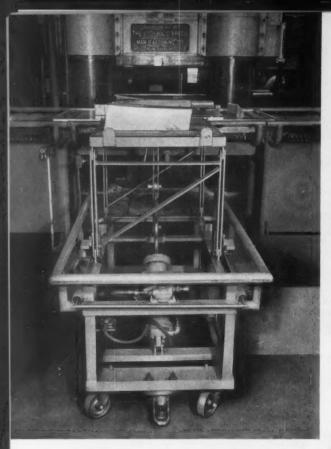


Fig. 4. A pneumatic lift-truck raises the die to the loading position, thus minimizing down time and manual labor.

pallet is over the press bed, it trips a switch, again locking the bar key, and the press ram descends automatically.

Conveniently located rotary bins, seen in the heading illustration, keep work blanks and formed parts in orderly arrangement. The bins index automatically in time with the pallets, so that the appropriate partitions of the bins are always adjacent to the pallets. This is accomplished by the use of an electric air valve and an air cylinder which are operated by the press ram during its forming cycle.

The second installation of a pallet conveyor was made on the 7000-ton HPM press shown in Fig. 3. Here the forged container is rectangular in section (40 by 72 inches), and the pallets are of corresponding shape and size. In all major respects, the merry-go-round functions as previously described.

Down time for die change-overs has been minimized by a specially designed 450-pound capacity lift-truck, seen in Fig. 4 in the elevated position. Dies to be placed in the press are laid

Fig. 6. Before the pad is reversed in order to use the unworn side, it is enclosed in a metal form and the "chewed-up" surface coated with epoxy resin. This prevents burning of the under side and the production of objectionable odors.

on the truck and raised by an air cylinder to the height of the press bed.

Because of the increased speeds obtained with the merry-go-round—three hits per minute on the Birdsboro press and two hits per minute on the HPM press—life expectancy of the rubber pads was reduced approximately 50 per cent. The practically continuous high-pressure forming causes the pad surface to become hollowed out and "chewed up," as seen in Fig. 5, with a consequent reduction in the quality of the parts fabricated.

The normal thought would be simply to reverse the pad in its container and use the new surface. This has the objection, however, that trapped air in the "chewed-up" surface when compressed at fast forming rates causes a small explosion and tends to burn the rubber inside the container, emitting extremely pungent odors in the work area. To overcome this, a metal form is wrapped around the pad, Fig. 6, and epoxy resin applied to the worn surface prior to reversing it in the container.



Fig. 5. High pressures and virtually continuous forming combine to "chew up" the surface of the rubber pad.



Cutter and Coolant Influence Screw Machine Design

By CLAUDE R. MORGAN, Consulting Engineer Cone Automatic Machine Co., Inc., Windsor, Vt.

PEAK machining efficiency has always dictated a careful study of the factors of machine design, cutting material, and coolant medium. The relatively recent conversion of multiple-spindle automatic screw machines to extensive carbide tooling shows that, in addition to considering these factors separately, it is necessary to weigh the influences they bear on each other.

Back in the horse and buggy days, screw machines operated at about 100 R.P.M., and tools of carbon steel cut at 10 to 20 surface feet per minute. A black odorous coolant or cutting fluid, flowing in the general direction of the tool area, had the apparently singular effect of enveloping the machine and operator in a cloud of smoke and mist. Work-pieces were so hot they could not be handled. Floors, covered with grease and oil, became hazardous. Short tool life, excessive machine down time, and a strict limit on the number of operations that could be performed, as well as on the types of material that could be worked—these were common conditions.

With the advent of high-speed steel as a cutting material, it was felt that a big stride had been made toward increased output. Too often, however, shops adopting high-speed steel tools found that machines were not geared for greater speed, or that lubrication was inadequate, or that the coolant just did not cool.

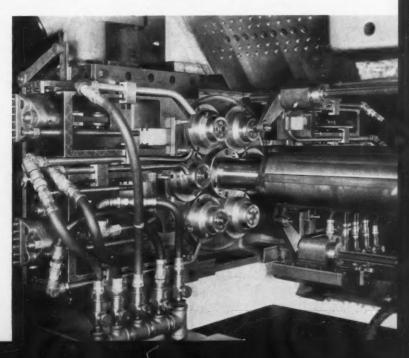
Then, as now, the value of water as a coolant was well known, particularly if it could be fortified and rust inhibitors added. By the time of World War II, water-based coolants were commonly employed, and improved production and tool life could be attributed to their use.

When carbides entered the picture as a cutting material, it was realized that neither the machines nor the tools could give top performance without a more efficient coolant and one that was properly applied. With the higher rates of stock removal of the carbides, the heat generated increased too. Coolants now had to dissipate heat not only from the tool area but from the machine headstock and other vital parts. For without the assistance of the coolant, the lubrication system of the machine could be seriously overburdened.

Once this additional role of the coolant was assumed, it became possible to adjust spindle, bearings, slides, and carriers to closer fits. Greater rigidity in the design of the equipment followed soon, and to safeguard coolants and lubricants from mixing with each other, better seals were developed.

Modern coolants are more than the oil and

Fig. 1. Elaborate coolant system of a six-spindle automatic screw machine has spouts located immediately above and below the various tool positions



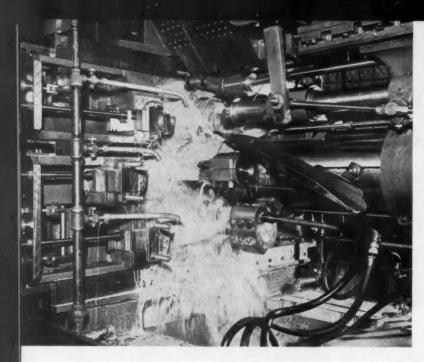


Fig. 2. A copious flow, with good pressure and accurate direction, assures proper coolant results

water emulsions of a dozen years ago. Many of them contain sulphur or other fortifying additives, and are antiseptically treated to prevent rancidity and skin irritation. Coolants successfully used in the research conducted by the Cone Automatic Machine Co., Windsor, Vt., include Antisep All-Purpose Base (Houghton); Vantrol (Van Straaten); and S.E.C.O. Heavy-Duty F (Sun Oil).

Film on Automation Produced by General Electric Co.

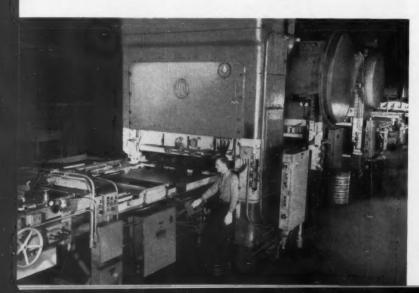
An industrial motion picture devoted to the history, growth, concept, and future of automation has been produced by the General Electric Co., Schenectady, N. Y. Titled "This Is Automation," the color film is the latest in a series of G.E. "More Power to America" productions. It defines its subject as "continuous automatic pro-

duction," and traces the evolution of automation since its inception in the early nineteenth century. This film has been prepared principally to show how middle- and small-size industries can improve their manufacturing operations by adopting at least one or more of the techniques that comprise automation.

The film points out how utilization of automation principles will raise productivity, increase the skill of employes, improve products, expand capacity, and lower operating costs. These and other salient facts are illustrated by a variety of industrial scenes, ranging from the production of pistons and cars to pretzels, during the film's thirty-minute running time. A typical view, seen in the accompanying illustration, shows a press line. In this installation, production has been greatly simplified by the utilization of automation equipment for moving refrigerator door blanks from one station to another.

"This Is Automation" has been produced prin-

cipally for manufacturing and engineering audiences, and is part of a "More Power to America" kit, which includes a 36-page bulletin entitled "Automation" and descriptive information. The entire kit is available on loan or can be purchased at cost from the Apparatus Sales Division, Section 6-210, General Electric Co., Schenectady 5, N. Y.



Scene from G.E. film entitled "This Is Automation" illustrates automatic transfer of refrigerator door blanks from one stamping station to another.

166-MACHINERY, January, 1956

"Squirt Welding" Accelerates Fabrication

of Heavy Steel Components



Fig. 1. Close-quarter squirt welding facilitates the fabrication of a bedplate for a sixteen-cylinder, vee type Diesel engine.

SEMI-AUTOMATIC hidden-arc welding of heavy steel components is accomplished in the plant of the Nordberg Mfg. Co., Milwaukee, Wis., on manual Lincolnweld machines, called "squirt welders." Seven of these machines are in constant use fabricating such large items as Diesel engines, compressors, hoists, and many types of processing equipment.

Squirt welding is a manually operated hiddenarc method in which the advantages of the hidden-arc process are combined with the versatility of a hand-held electrode. A 5/64-inch diameter mild-steel electrode wire is used. Welding currents of up to 600 amperes are fed through this small electrode wire, thereby producing extremely high current densities. This results in deep penetration of the arc, permitting the use of high welding speeds.

A manual Lincolnweld unit, connected to a welding generator, provides most of the features of an automatic welding head. The electrode wire is fed by the unit at a variable speed and at a pre-set arc voltage. The wire passes through a conductor cable and a welding gun, and then



Fig. 2. Most of the welding required on this Diesel-engine frame is done with a semi-automatic squirt-welding machine.

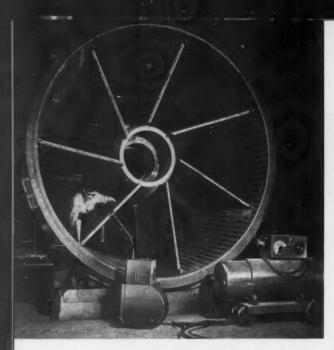


Fig. 3. Fabricating a large water-pump diffuser consisting of both rolled-steel plate and cast-steel components. Assembly is mounted on positioning rolls.

could have been done with fully automatic heads, but the positioning problem would have made the total cost prohibitive.

Welding of a frame for the same sixteencylinder Diesel engine can be seen in Fig. 2. The frame is fabricated of both steel castings and rolled steel-plate stock. Close-quarter welding, which comprises 90 per cent of the total, is accomplished with a squirt-welding unit as shown. The remaining weld areas, being in exposed locations, are handled by fully automatic heads.

Diffuser sections for use in heavy-duty water pumps are placed on positioning rolls during fabrication. This arrangement makes it easy to bring the joint of each successive vane into the most favorable position for welding. The assembly, shown in Fig. 3, consists of a heavy cast-steel hub, steel-plate vanes, and a housing, which are joined together entirely by semi-automatic squirt welding. As welding operations on sections up to 5 1/2 inches thick are frequently required, several passes are necessary.

The weldment illustrated in Fig. 4 is a portion of a suction bell for a large pump. This part, which is 17 feet in diameter, is shown from below, mounted on a 7-ton positioner. Segment seams and flanges are squirt-welded, the joints being brought successively into place for downhand welding by the positioner.

to the work. The long, funnel-shaped gun contains a granular flux that is gravity-fed to the work surface, blanketing both the arc and the crater as the gun is moved along the joint.

Although many of the welds to be made on the bedplate for a sixteen-cylinder, vee type Diesel engine, Fig. 1, are situated in cramped quarters, approximately 95 per cent of them are handled by this semi-automatic technique. Resultant savings in time, compared with conventional hand welding methods, have reduced welding costs from 40 to 50 per cent. Much of this welding

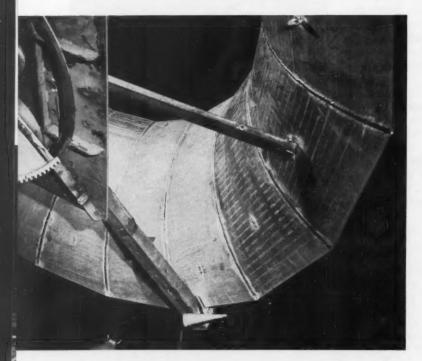


Fig. 4. Portion of a 17-foot diameter suction bell for a large water pump. A positioner, supporting the work, places the curved seams at the proper angle for welding.

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Lead-Bearing Free-Machining Steel Plates

A lead-bearing steel plate has been marketed under the trade name of "New E-Z-Cut" by Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill. This plate provides good machinability and superior welding, polishing, and plating properties. It can be flame-cut, formed, ground, or casehardened. The plate is available in thicknesses of from 1/4 inch to 3 inches.

The addition of lead to steel is said to act as a lubricant to the cutting tool. This results in less friction, which requires less cutting power. Other advantages are better chip formation, with minimum tool-edge build-up; fewer tool grinds; and improved finish of the machined product.

Silicone Fluid and Grease Lubricants Now Available

Two new type silicone lubricants have been made commercially available to industry by the Silicone Products Department, General Electric Co., Waterford, N. Y. "Versilube F-50"—a fluid—and "Versilube G-300"—a grease—lubricate about as well as petroleum oils and greases, and yet retain all of the typical silicone characteristics, one of which is an operating temperature range of from minus 100 to over 400 degrees F. The fluid flows at minus 100 degrees F., and bearings containing the grease show much smaller change in viscosity or consistency over this wide temperature range than other lubricants.

"Versilube F-50" is unique in that it is a tailor-made silicone polymer which obtains its properties without the use of additives. For example, it has lubricity without "oiliness" additives, low pour point without pour-point depressants, good temperature-viscosity properties without Viscosity Index improvers, and inherent high-temperature stability without oxidation inhibitors.

These lubricants are especially suited for use in "hot" industries such as glass, steel, ceramics, and petroleum. They are applicable to sleevebearing and ball-bearing motors, clocks, timers, instruments, fluid transmissions, refrigerators, pipe-thread compounds, hydraulic systems, and ball-bearing or chain-conveyor systems.

Non-Sparking Non-Magnetic Welded Aluminum Chain

The commercial production of welded aluminum chain has been announced by the McKay Co., 323 McKay Building, Pittsburgh 22, Pa. "McKay Welded Aluminum Chain" is non-sparking, non-magnetic, lightweight and corrosion resistant. The aluminum chain has a working load limit of 60 per cent that of a steel chain of comparable size, and weighs 65 per cent less. It is available in 1/4-, 5/16-, 3/8-, and 1/2-inch sizes, and in color-anodized finishes. The chain is being used in the chemical manufacturing, food processing, textile, petroleum refining, and explosives industries.

Highly Stable Titanium Alloy for Elevated Temperature Use

An alpha-beta titanium alloy that meets the need for toughness combined with good hot strength and stability is a recent product of the Mallory-Sharon Titanium Corporation, Niles, Ohio. This alloy, called "MST 6Al-4V," can be readily welded and heat-treated. It is primarily produced as a bar and forging alloy, but also has specialized sheet and plate applications.

The new alloy has good strength and stability at elevated temperatures and a wide hot-workability range. Other advantages are relative lack of notch sensitivity and good resistance to creep fatigue. It does not have the brittleness of many commercial high-strength titanium alloys, and can be used at temperatures up to 750 degrees F. with maximum creep-resistance. Carbon content is held to less than 1/10 of 1 per cent, which helps to provide for good machinability, uniformity, and notch toughness.

Some typical mechanical properties are: Ultimate strength, 150,000 pounds per square inch; yield strength (0.2 per cent offset), 130,000 pounds per square inch; reduction of area, 45

per cent; and hardness, 30 Rockwell C. The two principal alloying elements in this material consist of aluminum, in the amount of 5.5 to 6.5 per cent, and vanadium, 3.5 to 4.5 per cent, both on a weight basis.

New Barrel-Finishing Abrasives Overcome Wedging and Porosity Problems

Two barrel-finishing abrasives have been added to the line of the Norton Co., Worcester 6, Mass. One, known as "Tumblex T," consists of triangular-shaped pieces of Alundum vitrified-bonded abrasive. This was developed to overcome the problem of the wedging of abrasive in parts being tumbled. The other, "Tumblex N," is being used for finishing such items as diecastings, where there is danger of cutting through an outside protective layer and exposing a porous structure beneath.

Advantages claimed for "Tumblex T" include uniform size and shape; fast cut without cutting compound; low weight per cubic foot; even wear, without chipping or fracturing; and resistance to acids, compounds, or detergents.

"Tumblex N" cuts slowly, has little breakdown, and produces a bright color and luster on steel, zinc, brass, aluminum, and stainlesssteel parts.

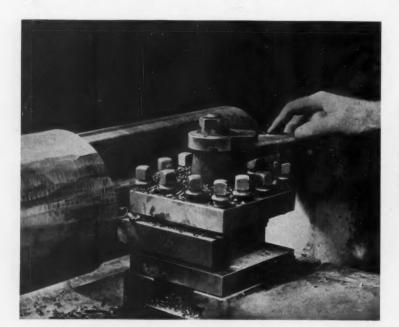
Steel-Cutting Carbides that Provide Great Edge Wear

Two steel-cutting cemented carbides developed to give great edge wear without loss of shock resistance have been brought out by the Carmet Division of the Allegheny Ludlum Steel Corporation, Pittsburgh 22, Pa. Designated "CA-606" and "CA-609" they contain an anti-cratering ingredient called Crystalloy, which uses titanium metal in place of titanium oxide to gain greater impact strength and crater resistance.

Grade CA-609 is designed for medium heavy machining, where cuts are in excess of 1/16 inch and where the application particularly requires resistance to wear. The other grade—CA-606—has a high resistance to edge wear, as well as to heat, and is especially useful where machining tolerances must be maintained. Both grades are available in all standard tips and tools. They can be made into special blanks of any shape or size required.

Tempered Beryllium Copper Wire for Forming Complex Shapes

A heat-treated beryllium copper wire which can be formed into springs, wire rope, and complex shapes, has been announced by Little Falls Alloys, Inc., 189 Caldwell Ave., Paterson, N. J. This wire is made by a process which includes both heat-treating and cold-working. The wire has an ultimate tensile strength of 185,000 pounds per square inch and is ductile enough so that it can be wrapped around its own diameter. Known as "Silvercote Tempered Beryllium Copper Wire," it exhibits good corrosion resistance, electrical conductivity, and fatigue qualities. It is non-magnetic and comes finished with a silver plating that allows easy soldering and provides low resistance electrical contact.



A carbide-tipped tool made of CA-609 titanium carbide is shown cutting an 8 1/2-inch forged toolsteel bar. Approximately 1/2 inch of material is being removed from a 4-foot length at a speed of about 300 surface feet per minute and a feed of 0.0208 inch per revolution. This carbide is best suited for removing large amounts of metal in a single pass with minimum wear.

INGENIOUS

Mechanisms selected

Mechanisms selected by experienced machine designers as typical examples applicable in the construction of automatic machines and other devices

Silent Ratchet Mechanism for Over-Running Drive

By H. B. SCHELL, Brooklyn, N. Y.

Ratchet mechanisms used on over-run drives frequently present problems of noise and wear. Shown in the accompanying illustration is a ratchet mechanism designed to operate silently, with a minimum of wear on its working parts.

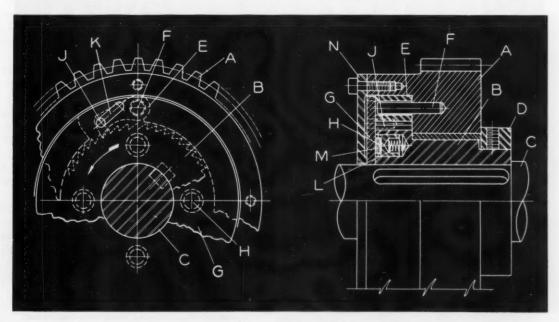
Consisting principally of a gear A and a ratchet B, the overdrive assembly is driven either by shaft C, to which the ratchet is keyed, or by the gear. The driving gear is mounted on the hub of the ratchet, and is free to turn on the hub, being retained by collar D. A recess is provided in the gear member to accommodate pawl E. Although the pawl pivots on pin F, it fits the pin loosely, and the actual pressure transmitted by the pawl is borne by the right-hand end of the recess in the gear.

When the shaft is driven by the gear, which

revolves counter-clockwise, the pawl drives the ratchet in the usual manner. But when the shaft, which also rotates counter-clockwise, becomes the driver, the gear is stationary, and the pawl over-rides the ratchet. One of the functions of the mechanism at this time is to prevent the pawl from dragging over the ratchet teeth.

This is accomplished in the following manner: When the ratchet rotates counter-clockwise, a brass cam-plate G moves with it due to the friction developed by four cork-tipped spring plungers H in the ratchet as they ride on the camplate. The movement of the cam-plate lifts the pawl from the ratchet as pin J, which projects from the pawl, slides up slot K in the cam-plate.

When the gear drives the shaft, the ratchet remains stationary until the pawl is engaged.



Ratchet mechanism on an over-run assembly which operates silently and with minimum wear on the parts

Since the friction generated by the spring plungers in this case will retard the rotation of the cam-plate, pawl pin J is forced down to the left in slot K. Therefore, the pawl engages the ratchet teeth and the entire assembly revolves as a unit.

Spring plungers *H* are contained in four blind holes bored in the side of the ratchet. Outward pressure of each plunger is exerted by a spring

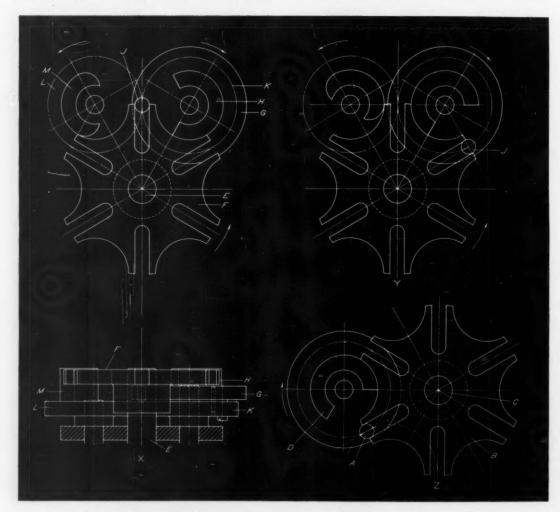
L against a cork friction button M, fitted into a hole bored in the plunger. Covering the ratchet mechanism is a protective plate N, which is relieved to avoid a large area of contact with the cam-plate. To assure the frictional movement of the cam-plate only under the desired circumstances, the area of contact is reduced to a minimum. There is also clearance between the cover plate and the shaft for the same reason.

Blocking Device for a Geneva Wheel

By W. PONT, Eindhoven, Netherlands

In one particular driving mechanism employing a Geneva wheel, it was found that the wheel was not sufficiently blocked. It frequently occurred that the moment pin A, shown at Z in the illustration, cleared the slot in Geneva wheel B,

a reverse movement would take place. This was due to a reactive force in the machine being driven from shaft C. The reverse movement was unchecked because blocking flange D is effective in one direction only.



Geared auxiliary blocking segment prevents reverse movement of Geneva wheel

The improved Geneva mechanism shown at X and Y, incorporating a reverse-motion stop, has been designed to eliminate this condition. Shaft E, which drives the machine, is fitted with a six-station Geneva wheel F. Driving wheel G, having a conventional blocking flange H and drive-pin J, is screwed and doweled to spur gear K. Meshing with this gear is a similar spur gear L on which is located a crescent-shaped reverse-motion stop M.

At X is shown the position of the components at the instant the Geneva wheel has been indexed one station. As drive-pin J leaves the slot, wheel F is blocked in the forward direction by a portion of flange H. The wheel is also blocked in the reverse direction by reverse-motion stop M.

The position of the components as the Geneva wheel is about to be indexed another station is shown at Y. Drive-pin J enters the appropriate slot in wheel F just as crescent-shaped stop M is disengaged from the wheel. Due to its shape, stop M disengages at a rate that will not impede the forward motion of the Geneva wheel, thus permitting smooth functioning of the mechanism.

Self-Contained Pneumatic Ejection System for Punch Press

By O. LICHTWITZ, London, England

A certain shop found it necessary to equip a crank type punch press with a pneumatic ejection system. Because of the absence of a compressed air supply within the shop, a self-contained unit, operated by the normal motion of the press, was installed, as shown in the accompanying illustration.

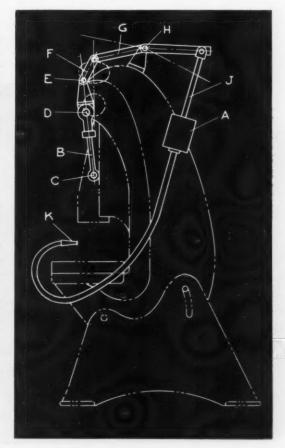
Power to operate the air pump A is obtained from the drive mechanism of the press. Connecting-rod B is extended at its upper end so that cross-head pin C, crankpin D, and pin E of the extension arm lie in a straight line. The path of pin E, which connects the extension arm to free link F, is a curve which, for practical purposes, can be considered as an ellipse. The minor axis of this curve is equal in length to the stroke of the crank, and the major axis is equal in length

to the stroke of the crank multiplied by $\frac{CE}{CD}$

To achieve maximum efficiency of the ejection system, the stream of air should be discharged during the latter portion of the up stroke only. This was accomplished by making the length of free link F, which actually consists of two parallel links, equal to the radius of curvature of the lowest part of the oval path traversed by pin E. This radius can be determined by applying the appropriate formula for an ellipse. Link G thus remains motionless during the initial part of the press up stroke, but pivots rapidly around shaft H during the final part of the same stroke.

As link G pivots, piston-rod J of the air pump, which is secured to the press frame, is depressed.

In this way, an air blast is discharged between the punch and the die. A nozzle K is attached to the end of a flexible air hose and directs the stream of air to any desired point in the work area of the press.



Ejection system for punch press utilizes air pressure from a self-contained unit

TOOL ENGINEERING Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Fixture for Gaging a Recessed Flange

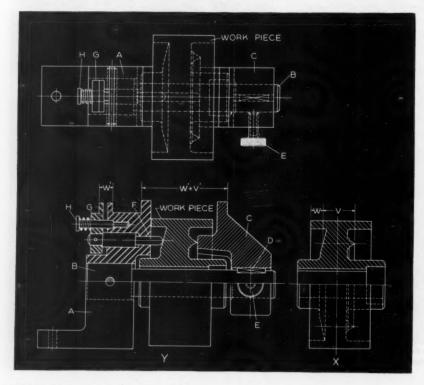
By W. M. HALLIDAY, Southport, England

Use of conventional methods in checking the location of both faces of the recessed flange on the part illustrated at X, proved to be time-consuming on a large production basis. Distances to be inspected are V, running from the crest of a tapered annular ridge to a corresponding point on the opposite inclined flange face, and W, extending from the second flange face to the lefthand side of the flange rim. This gaging operation is successfully carried out by using the fixture shown at Y.

Pressed into a hole, bored horizontally through the main upright portion of steel body A, and retained by a cross-pin, is locating shaft B. A smaller diameter of the shaft, projecting to the right, is hardened, then ground to a sliding fit with the bore of the work-piece.

The portion of body A protruding to the right serves as a banking face during gaging, and is therefore perpendicular to the locating shaft. A groove is machined across the top surface of the body to form two tongues. The inner vertical faces of both tongues are ground to provide accurate measuring surfaces.

Member C is a steel block that has been bored to a sliding fit over the locating shaft. This gaging member is maintained in correct vertical alignment with the body by key D which is fixed



A gaging fixture designed to accurately check the location of both faces of a formed recessed flange

to the right-hand end of the locating shaft. The width of the key is slightly less than that of the keyway in the bore of the work-piece.

A tongue extending across the top of member C has a ground right-hand vertical face. Also ground on this block is the left-hand vertical face that contacts the measuring crest of the recessed flange. Member C can be secured to the shaft by means of knurled lock-screw E.

Plunger F, sliding within a counterbored hole in body A, contacts the left-hand, or sloping, flange face of the work-piece at a point lying in a direct line with the crest of the opposite flange face formation, as shown. Plate G is pinned to the end of the plunger. A measuring surface is ground on the vertical face of a step machined across the top of the plate. Maintaining this plate in an upright position and at the same time forcing it to the right, is a spring-loaded shoulder stud H.

To mount a work-piece for gaging, it is only necessary to remove member C from locating

shaft B. The part is then slid over the shaft and located with the flange rim in contact with the machined vertical face of the body. As the work is moved into this position, plunger F bears against the inclined flange face and is moved slightly to the left, being held in contact with the work-piece by spring-loaded stud H. Member C is then replaced and adjusted so that it bears against the crest of the right-hand recessed flange formation as shown. Lock-screw E is then tightened.

A micrometer reading is taken between the right-hand measuring step on the body and a similar step on gaging member C. By subtracting a predetermined constant from this reading, combined distances W and V are ascertained. A second micrometer reading is then taken between the left-hand measuring step on the body and the corresponding step on plate G. In this case, after once again subtracting a predetermined constant, the measurement obtained is equal to distance W alone.

Two Improved Designs for Woodruff Key-Slot Gages

By L. W. LAZARICK, Philadelphia, Pa.

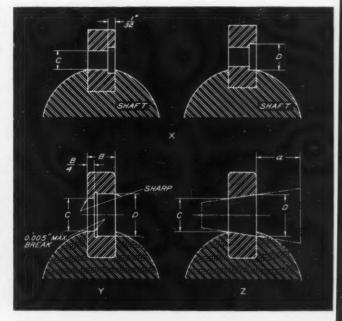
In the accepted method of checking Woodruff key slots, the "Go" gage disc used has two bore diameters which represent maximum and minimum depth limits. As can be seen in view X of the accompanying illustration, the small diameter C represents maximum slot depth; and the large diameter D, minimum depth. Gage-disc dimensions are given in Machinery's Handbook. A tolerance of plus 0.0004, minus 0.0000 inch is required for each bore diameter, with the length of diameter D fixed at 1/32 inch for all gage-disc sizes.

The shallowness of diameter *D* makes it difficult to be inspected with ordinary measuring instruments or plug gages when manufacturing the gage. For this reason, two alternate gagedisc designs, shown in views Y and Z, are proposed.

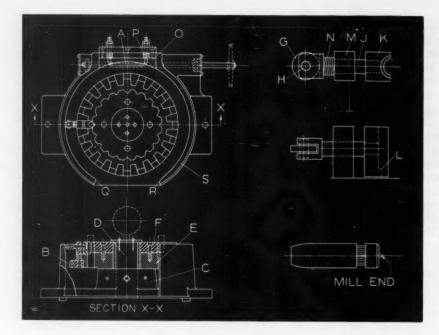
In view Y, the length of diameter C is shortened to one-fourth of the disc width, but not to less than 0.020 inch. The greater length of diameter D can thus be readily checked with a plug gage or a toolmaker's microscope. (When this diameter is only 1/32 inch long, light would be diffused when striking a radius in the hole.)

The second design, view Z, consists of taper-

boring the disc. The degree of taper is determined by the difference in the diameter of the bore at the two faces of the disc. A plug gage is first made to this taper, and by measuring the distance a, it is possible to control the size of the bore



Modifications of the Woodruff key-slot "Go" gage,
view X. are shown in views Y and Z



Milling fixture designed to automatically clamp and release small work-pleces held by moving springclamp devices

Milling Fixture Automatically Clamps and Releases Small Work

By ALEX S. ARNOTT, Toronto, Canada

Automatic clamping and releasing of small work-pieces are features of the fixture shown in the accompanying illustration. This fixture was designed to facilitate milling a burr from one end of cylindrical work-pieces left after a lathe operation and holds twenty pieces at a time. In the enlarged view of a work-piece (lower right) an arrow points to the centrally located burr.

The base of the fixture is fitted with standard milling machine keys and V-bolts for aligning on the machine table. Worm A driven by a pulley is geared to worm-wheel B, the latter being bored to fit over turntable E.

In the center of the casting is a large boss C which supports a press-fit spindle D and the turntable, which has a snug fit on a bronze bushing. The turntable holds all clamping units. Plate F has twenty accurately ground vees around its edge, one vee for each piece of work.

Each clamping unit has a hardened roller G mounted on a dowel H and is free to rotate. A roller holder J is a slide fit in a hole bored in the boring block and has a shoulder at the end for a clamping pad K which clears the face of the table. The semicircular face of the pad is accurately milled to conform to the diameter of the work while a machined ledge L supports the work during the operation. Bearing block M holds the clamping member and permits the pad to move in the direction of the plate by the action of spring N.

On the geared end of the fixture is an adjustable pressure block O, held in an outward position because of the pressure from springs P. By adjusting nuts on the holding studs, the spring tension is tightened or loosened.

In operation, the turntable rotates counterclockwise continuously, passing all the clamping units under a standard milling cutter. As the roller bears on a track, machined in the bore of the casting, and the units pass the gap in the casting between points Q and R, the spring on each unit pushes the clamp out to its maximum extension between the pad and the vee in the plate. The released work-piece drops clear of the fixture into a receptacle.

When the roller on each clamping unit contacts point S, it rides along a gradual incline on the roller track. With a clamp in this position, the operator drops the work between the locating vee and the clamping pad, the bottom of the work resting on the ledge. As the roller moves along the track, the pad is pressed more firmly around the diameter of the work. When the clamping unit reaches the pressure-block, the extra pressure holds it tightly for deburring.

After the roller passes the pressure-block, it rides down the incline of the track to the open gap where the spring releases the finished work. This operation is automatic and continuous. As the operator drops work into the clamping units, other parts are being machined.

Buick Cold-Forms Serrations on Hardened Shafts

Accurate, smooth-finish involute serrations of high strength are being rapidly produced on hard as well as soft automotive parts by the Roto-Flo cold-forming process, in which the work-pieces are rolled between rack type forming tools

> By CHARLES H. WICK Associate Editor

To attain the record output of 800,000 automobiles during 1955 and to provide for even higher production in the future, the Buick Motor Division of General Motors Corporation has been expanding manufacturing facilities, installing cost-cutting machine tools, and introducing improved techniques. When the current expansion has been completed, it will be possible to build 1,000,000 cars in a single year.

One outstanding improvement in manufacturing methods has been the introduction of a cold-rolling process for forming fine-pitch involute serrations on axle and gear components. With this set-up, the work-pieces are held between centers and rolled under extremely heavy pressure between reciprocating rack type forming tools. The metal on the periphery of the part is

displaced by cold-working to form the required

Production rates have been substantially increased and costs reduced. Also, the accurate involute serrations formed have a smooth surface finish and high strength. The serrations are cold-rolled on Roto-Flo hydraulically operated machines made by the Michigan Tool Co., Detroit, Mich. Such machines have rigid C-shaped frames. Two horizontal, reciprocating slides, mounted one above the other, are driven by two hydraulic cylinders. Master racks and a connecting gear, interlock and synchronize the two slides.

Each slide carries a rack type forming tool. These tools are step-ground in pairs to precise tolerances so that serrations near the leading

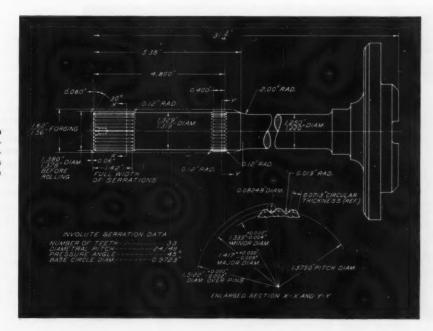


Fig. 1. Two serrations on this hardened steel rearaxle shaft are cold rollformed in one continuous operation with set-up seen in Fig. 2.

ends of the tools, which contact the work-piece at the start of their strokes, gradually start to displace the metal. Subsequent serrations press successively deeper into the part, as the racks are fed toward each other, until full depth is reached. Tools used at present are made from high-carbon, high-chromium alloy steel, but it is planned to try high-speed steel—particularly for forming hardened work-pieces—in order to obtain longer life between sharpenings.

The Roto-Flo process has been used in different plants for more than a year to cold roll-form accurate involute splines, oil-grooves, serrations, and other similar shapes on soft parts. However, one of the installations here described is believed to be the first successful application to hardened parts.

Rear-axle shafts, 31 3/4 inches long, are forged from S A E 1330 steel, and heat-treated to produce a Brinell hardness between 325 and 345 prior to cold-forming. The heat-treatment includes annealing in a lead pot to insure uniformity of hardness. Shafts for certain models of Buick cars must each have two serrations, one 1.42 inches long and the other 0.40 inch long as shown in Fig. 1. Both serrations are cold-formed in one continuous operation with the installation seen in Fig. 2.

This set-up consists of two Roto-Flo machines, arranged in line and connected by an automatic work-transfer device. Rear-axle shafts, which have been previously turned and faced to the required diameters and length, are manually placed in work-holding fixtures that are mounted on a

continuous chain conveyor and automatically indexed.

When a shaft has been indexed to the proper position on the first machine, it is pushed into rolling position by a center, mounted on a hydraulically operated reciprocating slide carried on an over-arm support. The shaft then passes through a guide bushing having a conical bore which directs the drilled hole in the leading end of the shaft onto another center, also mounted on a reciprocating slide used to unload the formed part.

With the shaft thus positioned horizontally between the tool racks, the work-piece is rolled between centers about its own axis as the racks automatically begin their strokes toward each other. When the serrations have been completely cold-formed, the shaft is automatically unloaded onto the fixture and indexed to the second Roto-Flo machine. The tool racks then return to their starting position. Electrical interlocks prevent the tools from returning until the work-piece has been removed.

In the next machine, the cycle is repeated to form the second serration on the shaft. Fig. 3 is a close-up view of this operation. The last few revolutions of the shaft are made with the forming-rack teeth at full depth. When the second serration has been completed, the shaft is again returned to the fixture and carried to the end of the line. At present, the shafts are manually unloaded from the fixtures, but it is planned to install automation equipment for this operation.

Actual cold roll-forming of the serrations re-

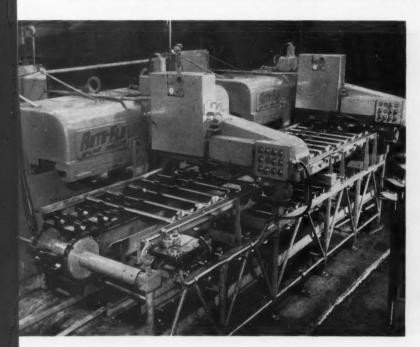
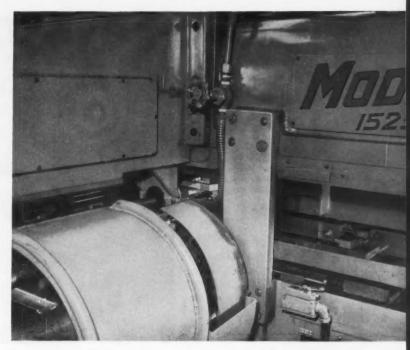


Fig. 2. Roto-Flo machine for coldforming serrations on rear-axle shafts. Work-pieces, carried on fixtures, are automatically indexed along unit.

Fig. 3. Close-up view of cold-forming operation shows the work-piece being rolled between rack type forming tools which are fed toward each other.



quires only 3 seconds, loading and unloading takes 6 seconds, and indexing, another 5 1/2 seconds—resulting in a completed shaft every 14 1/2 seconds. This represents a considerable savings compared to the 48 seconds previously required to cut the serrations in each shaft. Another advantage is that the chip removal problem has been eliminated. Some rear-axle shafts only require one serration and this operation is performed on a single Roto-Flo machine.

One requirement for successful cold roll-forming of involute splines or serrations is that the surfaces to be formed must be turned or ground to within plus or minus 0.001 inch of the predetermined rolling diameter. In the case of the rear-axle shafts, the surfaces to be serrated are turned on a Sundstrand lathe to a diameter between 1.376 and 1.378 inches prior to forming. As can be noted from the enlarged sectional drawing of the serrations, Fig. 1, this dimension is only 0.001 to 0.003 inch more than the pitch diameter of the formed serrations. In displacing the metal to form the 33 teeth and spaces, the rolling diameter is increased from 0.031 to 0.041 inch to produce the major diameter of the serrations, and decreased 0.043 to 0.049 inch in shaping the minor diameter.

Propeller stub shafts, forged from S A E 1330 steel and having a hardness of 34 to 36 Rockwell C, are also serrated by cold roll-forming at Buick. The serrations, 1.20 inches long, have twenty-eight teeth of 24/48 diametral pitch, with a minor diameter of 1.1250 inches, a pitch di-

ameter of 1.1667 inches, and a major diameter of 1.2083 inches. Prior to rolling, the surface to be serrated is ground to a rolling diameter between 1.170 and 1.172 inches. Grinding is employed instead of turning because an adjoining sleeve seat, 1.56 inches long, is ground in the same operation, and the diameter of the seat must be held concentric with the major diameter of the serrations within 0.001 inch total indicator reading.

This machine is automatically loaded from a magazine, and an automatic unloading device will be provided. Cold-rolling of the serrations requires only 3 1/2 seconds. Rearrangement of the metal grain structure during cold-forming produces serrations of high strength. Actual flow of metal conforms with the contour of the teeth. and tooth loads are normal to the grain flow. On the propeller stub shafts, it has been possible to reduce the width of the serrations from 1.50 to 1.20 inches. On other parts, the high torsion loads that can be transmitted by rolled splines have made it possible to replace deep, coarsepitch splines with shallower, fine-pitch splinesthus further increasing the strength by providing shafts of thicker cross-section. Also, the fact that splines or serrations can be formed at any required location along the shaft, even right up against a shaft shoulder without the need for a tool clearance recess, has provided increased design flexibility.

Another automotive part that is serrated by cold roll-forming is the rear-axle drive pinion.

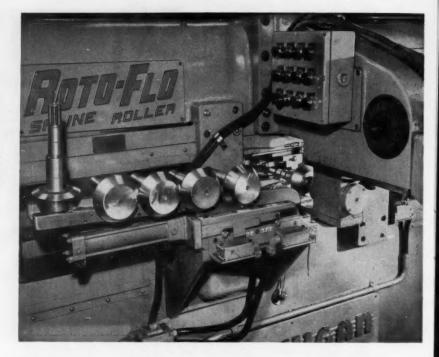


Fig. 4. Rear-axie drive pinions are automatically loaded from a magazine for cold roll-forming twentyeight serrations 1.820 inches long.

The pinions are forged from S A E 4118 steel and have a Brinell hardness of approximately 480. Serrations on this part are 1.820 inches long and have twenty-eight teeth of 24/48 diametral pitch, with a minor diameter of 1.1250 inches, a pitch diameter of 1.1667 inches, and a major diameter of 1.2083 inches. Surfaces to be serrated are ground to a rolling diameter between 1.170 and 1.172 inches.

Cold roll-forming of the rear-axle drive pin-

ions is done on the Roto-Flo machine seen in Fig. 4. This machine is also automatically loaded from a magazine, and automatic unloading will be installed. Tool racks on this as well as the other Roto-Flo machines can be adjusted longitudinally on the slides, to gain correct relationship with the work-piece axis. Also, because of the tapered design of the tools, they can be moved toward or away from the center of the part in order to control serration or spline size.



New techniques in the use of photomechanical materials and processes at the General Electric Co.'s Medium Voltage Switchgear Department, Philadelphia, Pa., now permit tracings, which formerly required from six to eighteen hours to produce, to be made in a matter of minutes. Re-usable film overlays of desired components are arranged into a composite transparency. From this transparency a translucent autopositive is printed and serves as the original tracing.



Talking With Sales Managers

By BERNARD LESTER
Management Consulting Engineer

Broadening the Product Lines

How can sales managers be assured of the stability of their sales volume? No sales manager can afford to neglect this question. Improved products, sales techniques, and widening customer contact are all necessary. But how about adding new products that will broaden the market and increase sales volume? Wise management is constantly in search of diversified products to help stabilize business.

The sales manager is the one who should sound the alarm to call attention to increasing instability of his company due to lack of variety in the products sold. With his knowledge of the market, who can better suggest change and addition? The selection of a new product line to manufacture and sell calls for ingenuity and judgment. The sales manager must take an active part in reaching such a decision.

Assuming that the sales manager is alert to the necessity of adding to his equipment lines, let us focus on suggestions for evaluating a proposed product. The following questions relating to distribution should be considered:

1. Will there be a growing demand for the proposed product? Obviously, entering a saturated market offers little attraction.

2. Is the product required by present customers? A new product used by existing customers can usually be economically and effectively introduced.

3. If the new product is bought by existing customers, will the prospects now contacted by the sales personnel make the purchase decisions? The actual time the sales engineer spends with his prospects is small compared with the total time devoted to selling. Two or a few related types of equipment can usually be sold with greater over-all efficiency than one.

4. Will the proposed product require changed selling policies? If present equipment is sold direct, a problem will arise in adopting a successful method of selling through distributors.

5. What new literature and technical data will be required? Prospects must be well informed and salesmen especially well grounded to answer every possible question. "Proof material" when introducing a new product is essential.

6. What new advertising and sales promotion problems will be involved in selling the product? Weigh carefully new avenues for advertising—direct mail, conventions, meetings, and displays.

7. Will the product require stocking at headquarters or local warehouses not needed for the existing line? Prompt delivery service is especially important when new items are introduced on the market.

8. How is servicing the new product to be done? By present service men or those specially trained? Nothing will destroy customer confidence or hinder future sales more than failure of the product itself or failure in its application.

9. Above all, what additional sales personnel will be required? How must they be indoctrinated and trained? The introduction of new equipment needs close coordination between design, manufacture, and sales.

10. In developing and introducing new equipment, what consideration should be given to selecting territories and prospects? In the field of industrial equipment, a step-by-step procedure is usually wise, to avoid a large initial demand that may prove embarrassing.

In the present competitive race, no sales manager's agenda is complete without new products. There are many examples of industrial equipment manufacturers who fall by the wayside because they fail to develop new products to keep them abreast in their field. Added to these are companies who develop new products and then struggle through a long and costly period of introductory promotion without adequate preparation. For these reasons, any program of distribution and sales should be carefully weighed, checked, rechecked, and liberally budgeted.

LATEST DEVELOPMENTS IN



Niles Giant-Size Convertible Planer Built to Machine Huge Castings

A gigantic convertible type Niles planer with a movable housing has been built by the Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio. This machine, developed to make possible substantial reductions in the time required to set up and machine exceptionally large castings, has been installed at the Tiffin, Ohio, plant of the National Machinery Co. Any casting within the width and height limits permissible for flat-car shipment can be planed on this machine. Figs. 1 and 2 show the set-up for planing

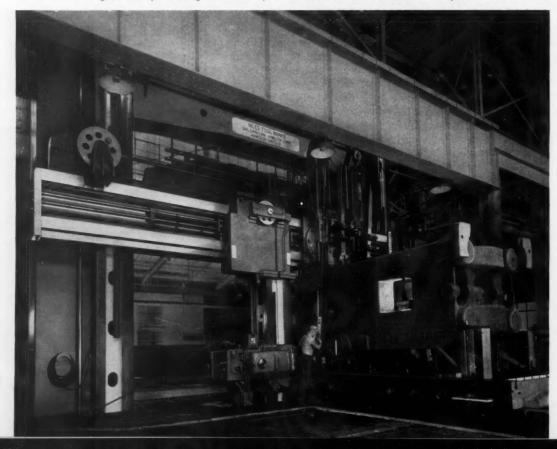
operations on the cast bed for a 2000-ton "Maxipres."

The machine is designed to combine the rigidity and accuracy of a double-housing planer with the versatility of a convertible planer. It has a capacity of 15 feet under the cross-rail, maximum width between the left and right vertical housings of 23 feet, and minimum width of 13 feet, with a planing length of 24 feet. There are two planing heads on the cross-rail, and two side-heads, one of which is mounted on the auxiliary hous-

ing. Planing speeds range from 3.4 to 102 surface feet per minute. The planer has a rail width of 41 feet and an over-all height of 28 feet 7 5/8 inches above the floor line; the auxiliary housing extends 18 feet below the floor line. Each of the rail planing heads is equipped with pendant controls which provide flexibility in adjusting the cutting action.

Pendant stations have a feedtraverse selector switch, a feed jog button, an "up-right, down-left" selector switch, a rail-head feed

Fig. 1. Niles planer of giant size set up to machine cast bed for 2000-ton "Maxipres"



Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

start and stop button, an "inchcut" and an "inch-return" button for the main drive, an automatic cut and automatic return main drive button, and a stop wobble stick mounted on the bottom of the pendant station. The controls make it possible for the operator to position all tools for planing and to make all adjustments without help.

All head slides on the machine are cast steel rather than cast iron, extending the travel to 60 inches, compared with the usual 48 inches possible with cast iron. All gibs for the heads are bronze instead of cast iron, eliminating the problem of pick-up. The table has plastic wear plates on the ways. All three tracks of the 52-foot bed of this 23-foot planer, Fig. 2, have non-metallic wear plates.

The rail-heads have rapid traverse in all directions, and power and hand feed for cross, vertical, and angular travel. The tool-slides and clapper-boxes have independent swivel adjustments, obtained through a worm-gear, pinion, and a rack segment at the top of each member. Side-heads also have power and hand feed for vertical, cross, and angular travel, and rapid traverse in all directions.

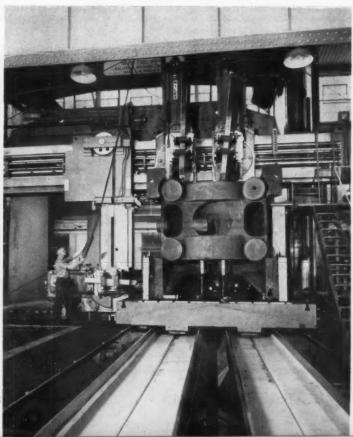
The planer has a table only 12 feet wide. This permits the operator to make a single set-up on work that is not full width. If a narrow work-piece were set up on the right side of a very wide table, it could be reached by the tools from the two rail-heads and from the right side of the planer, but the left-hand tool could not reach across the table. So a second set-up would be necessary to machine the left side of the work-piece. Thus the narrow table permits the machining of three sides of the workpiece in one set-up.

For an extra-wide work-piece, an auxiliary track or rail running parallel to the table can be used. A car riding on the track supports the overhanging section of the work. The adjustability of the left-hand auxiliary housing and planing head is one of the most important design features of the machine. It is this housing that gives the machine its flexibility. Located between the left-hand stationary housing and the table, the auxiliary housing is supported at the top and bottom by saddles dovetailed to the cross-rail and to the lower auxiliary rail.

Horizontal power adjustment is provided by two traverse screws,

one located on the cross-rail and one on the lower auxiliary rail. The machine is driven by a 100-H.P. variable-voltage, reversing motor with a speed range of 40 to 1200 R.P.M. The 100-kilowatt generator is driven by a 150-H.P., 220- to 440-volt, 3-phase, 60-cycle, motor having a speed of 1800 R.P.M. Other equipment includes a 40-H.P. motor for rail elevating and a 7 1/2-H.P. motor for feeding and traversing each of the four heads. Various other motors are employed for the rail clamp; auxiliary housing traverse; table

Fig. 2. View looking down 52-foot bed of 23-foot Niles planer built by Baldwin-Lima-Hamilton Corporation



MACHINERY, January, 1956—183



Fig. 3. Close-up view of tool-holders and pendant control for right-hand cross-rail head of planer seen in Figs. 1 and 2. Operator is standing on casting



Fig. 4. Floor-mounted operating station of Niles 23foot planer, which includes load indicator, main drive, ammeter, and complete push-button control

drive and table track lubricating pumps; and feed-box and lubricating pumps.

The main-drive motor is mounted below floor level on the right side of the machine facing the cross-rail. A major contributing factor to the rigidity of the machine is the foundation, which goes down to bedrock.

Circle Item 101 on postcard, page 221

Michigan Dial Type Machine with Work-Testing Unit

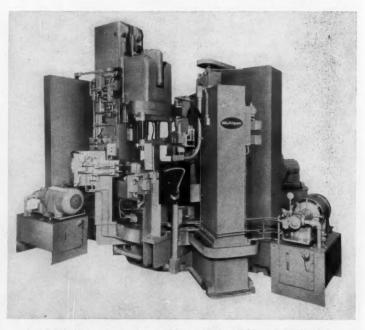
The Michigan Drill Head Co., Detroit, Mich., has recently completed a horizontal and vertical dial type machine with a built-in hydraulic testing unit. Designed and built for one of the leading automobile manufacturers, this machine drills, spot-faces, chamfers, finish-reams, taps, and tests 120 brake pedals per hour.

Although this is a special machine, it contains many standard Michigan components. Mounted on the welded steel base is a 42-inch automatic index-table with a six-station work-holding fixture. All fixtures have power clamps. A Michigan Hydro No. 20 drill press column is used for drilling and reaming and Master lead-screw tappers for tapping. All electrical

and hydraulic units are in accordance with J.I.C. standards.

One of the unique features of this machine is the hydraulic test provided for at the last station. Before the brake pedal is released at Station 6, the work is subjected to a special hydraulic ram test. In the event of a pedal fracture, the machine will shut itself off automatically. Thus, no rejection or fractured brake pedals can move on to the assembly line.

Circle Item 102 on postcard, page 221



Special dial type production machine made by Michigan Drill Head Co.



Fig. 1. Machinability testing lathe announced by Monarch Machine Tool Co.

Monarch Lathe Equipped for Machinability Testing and Lathe with Automatic Loader

A machinability testing lathe designed especially for use in metal-cutting research work is announced by the Monarch Machine Tool Co., Sidney, Ohio. This lathe, Fig. 1, has an infinitely variable cutting speed range of from 625 to 3775 R.P.M., higher speeds being obtainable with special pick-off gears. It has sufficient power and rigidity to carry out practically any desired type of cutting test, and is adaptable to a wide variety of tests and research instrumenta-

The resistance of a metal to plastic deformation and the amount of energy converted to heat can be measured by the machine, and the normal tool wear then computed. From this data, a balanced cutting condition can be selected that will give economical tool life at high surface speeds.

The new lathe, with a design based on the company's regular Mona-Matic series, is supplied with a 20-H.P. variable-speed maindrive motor and standard type, mist-lubricated headstock. headstock spindle has a 6-inch A-1 camlock spindle nose for mounting any chuck preferred. All operating controls, including those for spindle speed, coolant pump, starting, stopping, and free-spindle operation are apron-mounted. The heavy-duty tailstock has an antifriction, air-operated center. A

special high-capacity coolant pump also is standard equipment. The lathe has a clearance diameter of 15 inches, and a swing of 8 inches over the compound rest. It is supplied without instrumentation to enable the user to select the test instruments required for his particular research program.

A hydraulically actuated automatic loading mechanism has been brought out by the company for use on its recently announced Model 21 Mona-Matic lathe, Fig. 2. A gravity chute and a shuttle conveyor, designed to hold a supply of rough work-pieces, are incorporated in this hydraulically actuated loader. Each of the work-pieces is automatically positioned between the centers of the machine by the loader, which then actuates the "Multicycle Programmer."

The programmer controls the four-cut automatic work cycle of the lathe, and removes each finished piece. No manual control is required for any portion of this operating sequence. The loading mechanism and the lathe function continuously as long as a supply of new work-pieces is maintained

in the conveyor chute.

Special safety switches are incorporated in the tailstock to prevent lathe operation if the workpiece is not properly centered by the loader mechanism. An airoperated chuck is also utilized during the automatic positioning and removal of work-pieces, actuation of the chuck being regulated by the control equipment of the loader.

During operation, the rough work-pieces resting in the conveyor chute of the loader are engaged one at a time between a pair of traveling centers. These centers

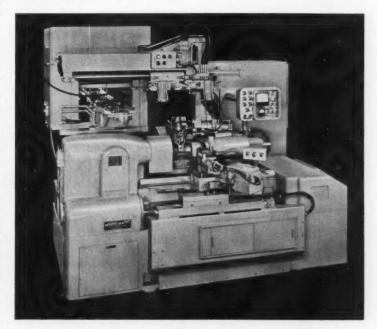


Fig. 2. Monarch Mona-Matic lathe equipped with automatic loader

transport the individual piece horizontally to a position above the work area of the lathe. At this point the piece is grasped by one pair of arms of a double-armed, rotating head, whereupon the traveling centers release the work.

The automatic loader can be arranged to handle work in an automation sequence on a series of machines.

Circle Item 103 on postcard, page 221

Ex-Cell-O Center Lapping Machine

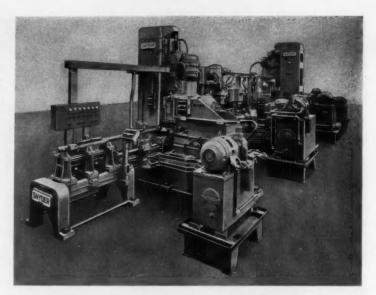
The lapping of work-piece centers on a machine built recently by the Ex-Cell-O Corporation, Detroit, Mich., is an inexpensive operation that requires only a few seconds. The lapping operation makes corrections for distortion caused by heat-treatment and removes any scale or scoring from the center.

Both motor and spindle are supported by a sturdy base and stout column. The work-rest can be adjusted to accommodate pieces of different lengths. A lapping stone dresser which swings out of the way when not in use is provided with the machine. An adjustable angle dresser is available as extra equipment.

Circle Item 104 on postcard, page 221



Center lapping machine built by Ex-Cell-O Corporation



Snyder transfer machine for exhaust manifolds, which uses a twisted rail to locate parts

Snyder Segmented Transfer Machine Designed to Handle Work Without the Use of Pallets

A segmented transfer machine for rapid processing of automotive engine exhaust manifolds has been built by the Snyder Tool & Engineering Co., Detroit, Mich. This machine features a twisted sliderail designed to move and locate work without employing pallets. The machine has twenty stations and is 43 feet long. It performs all operations (such as drilling, tapping, milling, counterboring and chamfering) on the castiron manifolds except finishing the mounting faces. These surfaces are ground before the parts are loaded into the machine, for locating purposes. Two bushings and two pins of different sizes are also hopper-fed and assembled into the manifold by the machine. The production is 106 manifolds per hour, operating at 75 per cent capacity. Gaging devices are incorporated in the machine to assure throughdrilling of holes that are to be tapped to avoid tap breakage.

Pallet fixtures ordinarily used to transfer work of this kind from station to station and rotate it by auxiliary locating devices, when required, have been eliminated. Instead, the manifolds are loaded directly into the machine with their ground faces on the slide-rails. The pieces are pushed from station to station on the rails by an indexbar, and are correctly located and clamped in each machining station

as they pass through the various machine segments.

When the manifolds are half way through the machine, they are tilted to an angle of 45 degrees for machining operations. The tilting is accomplished by having the slide-rails twisted to the required angle. This eliminates the need for auxiliary locating devices. Segmented automation has been applied to this machine to provide separate bases and control panels for each of the eight segments, in order to facilitate maintenance, increase flexibility, and simplify construction problems.

In operation, a cast-iron exhaust manifold with ground mounting faces is loaded on rails in the first segment and a push-button is pressed to initiate an automatic operating cycle. One master control panel provides the means for starting and stopping all the segments from one point. They are started in timed sequence to avoid excessive power surges. The timer control for a motor-driven central lubrication system is in the master control panel, as are the sequencing and safety interlocks for the indexing and the initiation of cycle sequences of individual segments. The light panel that shows the operating condition of all segments is also located on the master control panel.

Circle Item 105 on postcard, page 221

"Quartet" Milling Machine with Indexing Spindle

The horizontal spindle, rather than the saddle and table, can be indexed for universal operation on a No. 2 milling machine built recently by the U.S. Burke Machine Tool Division, Cincinnati, Ohio. This machine, called the "Quartet," has the spindle mounted in a massive turret which can be swiveled 360 degrees by means of a worm and worm-wheel. When the machine is used as a universal horizontal miller, the spindle is indexed to the required angle. This feature provides the rigidity required for precision work, and enables the table to retain its inherent stability. Provision is made for locking the turret securely at the desired angle.

In addition to universal and horizontal operations, the machine will perform vertical and angular milling work. Change-over from one type of milling to the other can be accomplished quickly and easily. While designed primarily for use in maintenance work and in tool and die shops, this machine can also be employed on production jobs. It is possible to mill, drill,

tap, bore, face, and counterbore a work-piece to extremely close tolerances in one setting without the use of fixtures. Also, either the horizontal or the vertical spindle can be used for milling operations on large work-pieces secured to a fixture on the floor.

The horizontal travel range is 30 inches; cross travel, 11 inches; and vertical travel, 16 1/4 inches. The horizontal spindle has either a No. 40 or a No. 50 taper, and is driven by a 3- or 5-H.P. motor. Power for the independently op-

erated feed of the vertical head is provided by a 1 1/2-H.P. motor mounted on the rectangular overarm. The infinitely variable speed of the horizontal spindle ranges from 29 to 1450 R.P.M. The horizontal and vertical spindles can be used simultaneously, and the machine can be operated while the turret is being indexed.

Standard equipment includes rapid-traverse power feed to the saddle and table. The over-arm is positioned through a rack and pinion, and the vertical head can be tilted to the required angle.

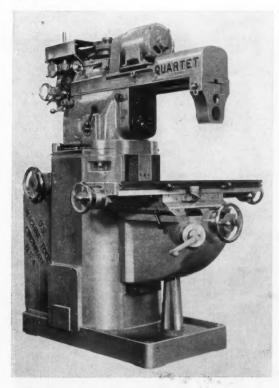
Circle Item 106 on postcard, page 221

Brinell Hardness Testing Machine with Sorting and Marking Features

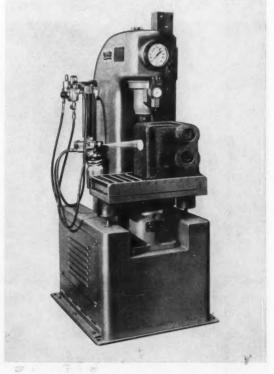
Steel City Testing Machines, Inc., Detroit, Mich., has designed a new Brinell hardness tester with a paint spray attachment synchronized with the testing cycle of the machine so that the relative hardness of parts is automatically indicated by a spot of paint. Sorting of pieces is done by the machine and is said to result in less operator fatigue and fewer errors.

Brinell limits on the machine are adjustable. The machine shown is a single-purpose unit with fixed vertical opening. Other models available have adjustable openings to handle a variety of work. Spray units can be cycled to indicate work in acceptable range or to indicate "too hard" or "too soft" specimens.

Circle Item 107 on postcard, page 221



Milling machine with horizontal and vertical spindle built by U. S. Burke Machine Tool Division



Brinell hardness testing machine designed by Steel City Testing Machines, Inc.

Huge H-P-M Plastics Injection Molding Machine

A plastics injection molding machine with a clamping pressure of 3000 tons and a capacity for molding parts weighing as much as 400 ounces is announced by the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. This Model 3000-P-400 machine, said to be the largest ever built, completes a dry cycle in twenty-two seconds. It has an exceptionally high injection speed of 400 ounces in six seconds, a positive "shot" measuring device, and a pre-plasticizing chamber which plasticizes independently of the machine cycle.

Other features include highspeed clamp build-up (the mold being closed and a full clamp pressure of 3000 tons developed in six seconds); hydraulic ejectors on the stationary die-head side, eliminating the use of pull chains when ejection is from the sprue side; and a built-in hydraulic mold elevator and positioner to reduce mold setting time.

Two of these machines already in use have been profitably applied to the production of smaller parts. They were designed to mold commonly used virgin thermoplastics, such as polystyrene, cellulose acetate, cellulose acetate butyrate, and acrylics.

Circle Item 108 on postcard, page 221

Olsen Single-Purpose Impact Tester

A single-purpose impact tester, designed to meet the specific needs of those interested in Charpy impact tests, has been introduced by the Tinius Olsen Testing Machine Co., Willow Grove, Pa. This Olsen 120-foot-pound capacity Charpy impact machine provides high testing accuracy and meets all Government requirements for normal and cold temperature testing of metals, plastics, and various other materials.

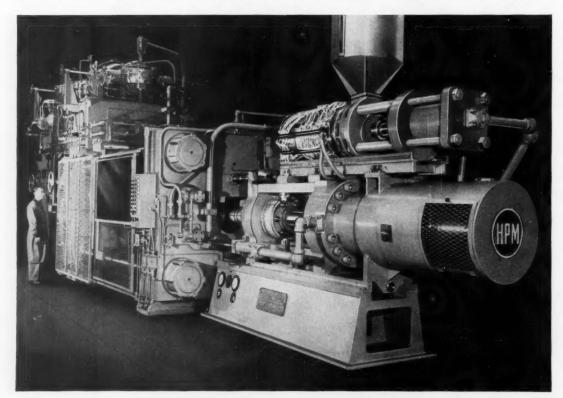
Ruggedly constructed, this machine minimizes deflections and eliminates variables by transmitting the impact action directly to the heavy base. The vise, an integral part of the base, affords maximum clearance for broken specimens while the striking bit permits making Charpy impact



Olsen Charpy impact tester

tests with a minimum number of parts.

In operation, a specimen is centered in the vise at the base of the tester. The operator, by moving a latch-lever, releases the one-piece hammer and pendulum which swings down, strikes specimen, then follows on through to a height dependent upon the amount of energy absorbed in breaking the specimen. The indicator re-



Plastics injection molding machine built by Hydraulic Press Mfg. Co.

mains at the point of absorbed energy. On the return swing, the hammer is caught, lifted into the latch in position for the next test while adjustments are made.

Circle Item 109 on postcard, page 221

Zagar Equipment for Special Drilling Job

Forty holes, each 0.093 inch in diameter, are drilled simultaneously in a piano plate on a machine equipped with a gearless drill head made by Zagar Tool, Inc., Cleveland, Ohio. The operating cycle of this machine is fully automatic, and consists of clamping, feeding of drill head by a 5-inch stroke Zagar feed unit, drilling, idling, and unclamping. Clamping is accomplished by compressed air.

The 0.093-inch holes are drilled at an angle of 14 degrees, and the spacing between centers varies from 1/4 to 3/8 inch. A noteworthy feature is the open-frame design, which allows handling pieces of awkward shape, although this design restricts the machine to lighter work. The drill head can be changed to accommodate different drilling patterns. The hydraulic feed is self-contained.

Circle Item 110 on postcard, page 221

"Red Ring" Gear Checker for Inspecting Internal Gears

A "Red Ring" gear checker for inspecting spur or helical internal gears with pitch diameters up to 18 inches is now available from the National Broach & Machine Co., Detroit, Mich. This Model SIG-18-inch checker is designed to check tooth-to-tooth spacing, pitch or root diameter, eccentricity and size, as well as parallelism of spur gears from 2 to 48 diametral pitch having pitch diameters from 2 to 18 inches. The maximum outside diameter of internal spur and helical gears that can be checked is 26 inches.

The tooth index accuracy of an internal gear mounted in the work fixture is checked by bringing the ball point on the over-arm supported checking head into contact in a tooth space and a pivot finger into contact with the side of a tooth in the adjacent tooth space. The opposite end of the pivot finger actuates a 0.0001-inch indicator. Indexing the work gear to the next space causes the indicator to read variations in tooth spacing.

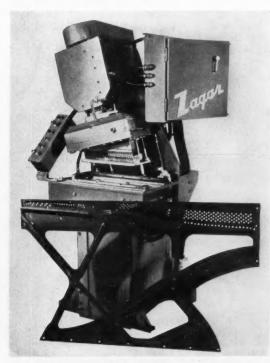
The arm on the back of the checking spindle in this head actuates a 0.0005-inch indicator

that registers the amount of advance of the ball point from space to space, thus measuring the eccentricity of the gear teeth. The size of the teeth can also be checked by setting the 0.0005-inch indicator to zero with a master gear and noting variations from this reading when other gears are checked.

Root diameter size and eccentricity can be checked independently with the over-arm supported checking head, by replacing the ball point with one that clears the sides of the teeth.

Parallelism of spur gear teeth is checked by bringing an indicator finger into contact with a tooth face and traversing it up or down the face of the tooth by turning a small handwheel. The indicator registers the amount and direction of taper or out-of-parallel condition. It will also check the amount and position of crown. Two indicators facilitate checking either side of the teeth. The gear checker occupies a floor space 30 by 40 inches and the height from the floor to the top of the base is 40 inches.

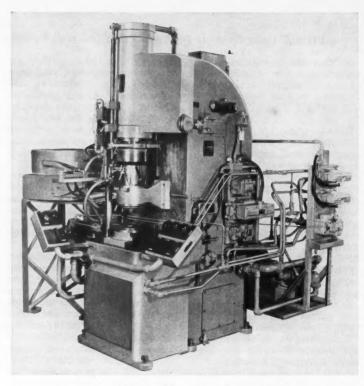
Circle Item 111 on postcard, page 221



Zagar gearless drill head designed to drill forty holes simultaneously



"Red Ring" gear checker for inspecting spur and helical internal gears



Press equipped for assembling automotive parts, built by the American Broach & Machine Co.

Press Equipped to Assemble Automotive Transmission Parts

A 25-ton press, equipped with electrical controls for use in automatically assembling and staking the drive flange of an automotive transmission to a pinion gear and then assembling a bushing in the gear, has been brought out by the American Broach & Machine Co., Ann Arbor, Mich. The machine is provided with a special workbase, a hydraulic assembly cylinder, hydraulic loader, and hopper feed. A spiral bar and nut assembly guides the flange in the helical spline teeth of the gear. Tooling includes a helical spline locator for positioning the gear in the worknest from previously cut teeth: and hardened and ground staking tools mounted on the ram nosepiece.

The operator loads a gear in the work-nest, using one of the gear teeth for radial positioning. He then loads a flange over the splined nose-piece of the ram, locating it radially from the previously cut internal splines. The control buttons are then pushed to start the machine cycle. The ram descends, pressing the flange

or pressed into the gear from under the work-nest.

A hydraulic cylinder with cross-

A hydraulic cylinder with crosshead and guide-bar arrangement interlocked to the machine cycle, automatically assembles the bushing in the gear. The bushings are fed continuously by a rotary hopper into a magazine tube feed. A hydraulic loading slide interlocked to the cycle transfers the bushings, one at a time, into the assembling position under the worknest. After the bushing has been assembled in the work-piece, the ram returns to permit unloading.

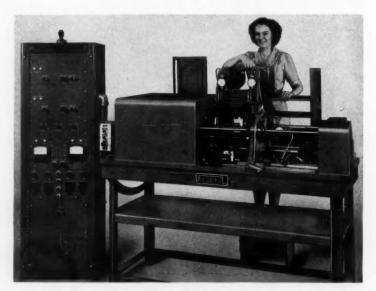
Circle Item 112 on postcard, page 221

Federal Gage Checks and Sorts Push-Rods

A fully automatic sorting gage designed and built by Federal Products Corporation, Providence, R. I., is an integral part of the production line of a manufacturer of automobile push-rods. The gage is conveyor-fed, and performs six checks. "Electricator" units and reluctance hardness testers check outside diameter and hardness at both ends, over-all length, and straightness. The parts are sorted automatically into three categories -good, salvage, and scrap-at the rate of 2500 per hour. Good parts continue by conveyor to the next operation, while scrap and salvage parts are taken out of the production line.

Percentage counters at each

over the gear and staking the two members together. The ram remains down, holding the workpiece until a bushing is assembled



Production-line gage built by Federal Products Corporation



Fig. 1. Farval air-operated pumping station with time-clock control for lubricating gears

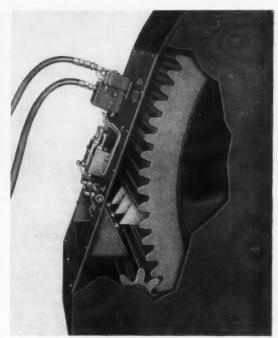


Fig. 2. Spray panel mounted on gear housing for spraying lubricant on the gear teeth

gaging station provide maximum manufacturing control. When the number of rejections at any station exceeds the allowable limit, the gage flashes signal lights and operates relays to shut down the unit at that station.

Circle Item 113 on postcard, page 221

Chute-Fed Automatic Rod-Bending Machine

An automatic machine that makes one or two bends in each end of steel rods at production rates up to 960 rods per hour is announced by the Expert Automation Machine Co., Detroit, Mich. A mechanically operated indexing drum carries the rods from a feed chute to two bending stations. Inner and outer bends are produced at each rod end by hydraulically operated single-rotation bending dies. Finish-bent rods are carried from the machine by a roller-chain conveyor.

The machine illustrated bends heat-treated, spring steel rods 3/8 inch in diameter and 5 feet long, to form automotive trunk lid torsion bars. One of the two 90-degree bends made on each end of the rod has a leg only 3/4 inch long.

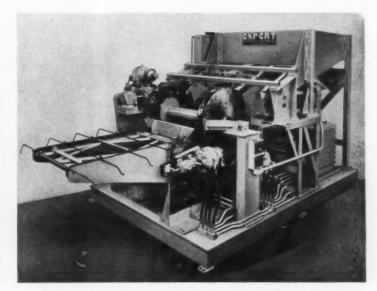
Circle Item 114 on postcard, page 221

Farval Spray Panel for Lubricating Gears

An automatic, air-operated, time-clock-controlled pumping station connected to a three-outlet spray panel for lubricating gears has been developed by the Farval Corporation, Cleveland, Ohio. The pumping unit, Fig. 1, delivers lubricant at regular intervals as

determined by the electric timer. Two, three, or more spray panels can be served from one central pumping unit merely by the use of cross-piping in the lubricant supply lines.

The spray panel, seen in Fig. 2 mounted on a gear housing, il-



Rod-bending machine announced by the Expert Automation Machine Co.

lustrates the application of this new equipment for spraying lubricant on the pressure side of gear teeth. The principle shown here is applicable to both the handoperated and automatically controlled types of panels.

Circle Item 115 on postcard, page 221

Hamilton Mechanical Presses Built in Wide Range of Capacities

The Hamilton Press Division, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio, has announced a new line of mechanical presses, which includes welded steel, top-drive, full eccentric type presses in capacities ranging from 400 to 4000 tons.

The machines feature the new Hamilton "Double Lube System" of lubrication. This system not only incorporates the pressure feature of lubrication but also, through the use of troughs and gravity flow, keeps all bearings lubricated even if the pressure flow switches in the standard pressure lubrication system fail. Normally all bearings are doubly lubricated by both the pressure and gravity systems.

The air-clutch used on these machines embodies the unusual feature of low-inertia starting in combination with mechanical interlocking. It does not depend on the

timing of valves and switches to prevent overlap, and the low-inertia design permits clutching and declutching at speeds almost equal to the continuous speed of the press. In addition, this clutch can be inched at low torque when setting dies. If the slide should become stuck in the bottom deadcenter position when setting dies, it can be easily released, since it is held in the locked position by a comparatively low torque.

Circle Item 116 on postcard, page 221

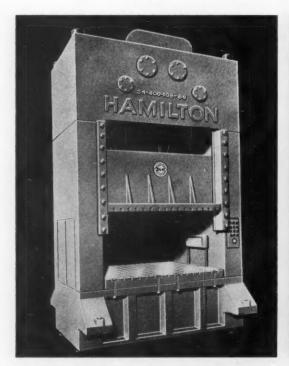
Time Recorder Designed for Machining and Processing Operations

The Heat-Timer Corporation, New York City, has introduced a precision instrument called the "Time Recorder + Totalizer," which provides a continuous operation record of any electrically operated machine or process. Chronologically marked tape continuously passes through this instrument recording the time and length of every operating and idle period.

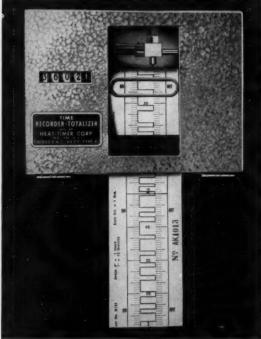
A quick glance at the tape will give complete information about the operation of the machine or process being monitored. An additional feature is the totalizer, which gives complete operating time of the equipment.

The instrument is designed to increase the efficiency of office procedure, plant and production control, and cost analysis. It can be installed as an integral part of the equipment, as a remote installation, or as a portable tool. Standard tape speeds available are: 1 inch per five minutes; 1 inch per fifteen minutes; and 1 inch per hour. A counting device can be furnished in place of the time totalizer for determining the number of operations or pieces produced or processed by machines such as punch presses, drill presses, stamping machines, and injection molding equipment. The recorder is designed to operate on 60-cycle, 115- or 220-volt alternating current.

Circle Item 117 on postcard, page 221



Hamilton press announced by Baldwin-Lima-Hamilton Corporation

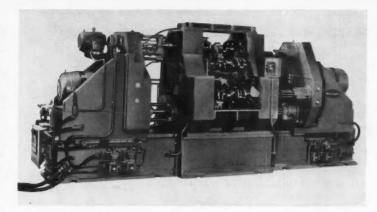


Time-recording instrument introduced by Heat-Timer Corporation

Special Processing Machine for V-8 Engine Crankshafts

A gigantic machine for processing crankshafts for a well-known manufacturer of V-8 engines has been built by the Michigan Drill Head Co., Detroit, Mich. This massive, ruggedly built machine drills, chamfers, finish-reams, form-seats, and taps both ends of the crankshaft at the rate of 100 crankshafts per hour at 100 per cent efficiency. It is a double-end trunnion type machine with pot type heads that permit inexpensive replacement in case of engineering changes. The heads also feature lead-screw spindles, with quick-change nuts designed for easy replacement.

The machine is built up from standard floor type feed units which have hardened-and-ground ways. The trunnion fixture has power-operated shot pins for positive location of the work prior to



Giant-size machine for processing V-8 engine crankshafts built by the Michigan Drill Head Co.

the machining operations. The machine is built to J.I.C. electrical and hydraulic standards and is automatically lubricated.

Circle Item 118 on postcard, page 221

Bliss Hydraulically Operated Keyseating Machine

An improved hydraulic circuit, with flow control valve incorporated with an integral relief valve to give minimum power consumption and minimum oil heating, is a feature of an improved keyseat-

ing machine now being built at the San Jose, Calif., plant of the E. W. Bliss Co. The flow control valve of this machine allows the hydraulic system to operate at a pressure equal to the load requirements for the particular key to be cut. This permits the circuit to be set to the maximum allowable pressure with a minimum overflow oil pressure setting. A sequence valve has been incorporated in the system to give positive operation of the tipping cylinder before the cutting stroke begins.

The machine cuts keyways from 1/4 inch wide up to and including 2 inches wide, and up to 12 1/2 inches in length. Parts of practically any outside diameter can be

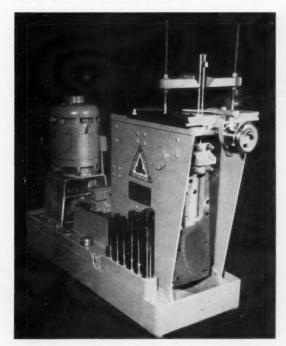


Fig. 1. Hydraulically operated keyseating machine built by E. W. Bliss Co.



Fig. 2. Machine shown in Fig. 1 set up for cutting keyway in pinion

keyseated. The hydraulic equipment is driven by a 5-H.P. motor having a speed of 1200 R.P.M.

To cut a keyway, the proper bar is selected from the seven available bars mounted in a rack on the keyseater. This bar is then set in the slide and secured by tightening four bolts. Next, the part to be cut is centered with the device provided, and the hold-down clamp tightened. One trip finger (for length of stroke required) is then adjusted, and the table is fed in to the required cutting depth.

The cutters may simply be ground with the necessary clearance from standard high-speed steel ground bit stock. Tapered keyways are easily cut by setting a dial, located at the rear of the machine table. One complete turn of the dial provides a taper setting of 1/8 inch per foot.

Accessory attachments for use with the keyseater include internal centering mandrels which can be employed when it is desirable to locate the work from the

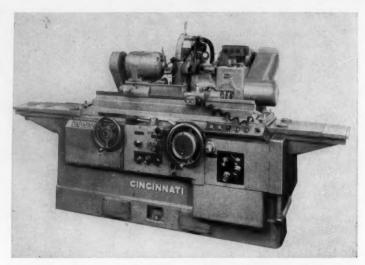


Fig. 1. Cincinnati Filmatic plain grinding machine equipped for automatic push-button infeed and electric gage sizing

bore. A spline-cutting indexing attachment is also available.

Circle Item 119 on postcard, page 221

Cincinnati Filmatic Plain and Hydraulic Grinding Machines

Exclusive design features for traverse and infeed grinding of medium-size parts have been incorporated in the new Filmatic 6-inch R, 10-inch L, 10-inch R, and 14-inch L plain hydraulic grinding machines recently announced by Cincinnati Grinders Incorporated, Cincinnati, Ohio. The two machines with letter "L" designa-

tion are light types having all the characteristics of the machines with the "R" designation and are built in the same lengths, but have the extra swing capacity required to accommodate a flange or projecting arm on the work-piece.

Filmatic bearings for the grinding wheel spindle automatically adjust the oil film pressures to suit the variations in forces created by the grinding action. Automatic balancing of the grinding wheel can be accomplished in twenty seconds by unclamping and clamping a conveniently located lever. Control elements and pushbutton panel are centrally grouped within easy reach of operator.

Hydraulically operated power tables have traverse rates that are infinitely variable from 3 inches per minute (for truing) to more than 200 inches per minute. The length of table traverse can be automatically controlled from the full rated stroke to one as short as 3/32 inch. Tarry at each end of the stroke is adjustable from zero to five seconds. The hand table traverse has a two-speed arrangement. Merely pulling out or pushing in the handwheel provides either 0.200-inch or 5/8-inch traverse per revolution. Graduated dials for fine and quick hand adjustments read to as low as 0.000050 inch on the work diameter. Automatic feed at table reversal is infinitely variable for reductions in work diameter of from 0.0002 to 0.005 inch.

Headstocks for 6-inch R and 10-inch L machines are powered by a 1/2-H.P. alternating-current motor while the 10-inch R and 14-inch L machines have 1-H.P., alternating-current motors. Four spindle speeds range from slightly less than 100 R.P.M. to nearly 300 R.P.M. The smaller machines are built in 18- and 30-inch lengths while the larger machines are built in 18-, 36-, 48-, 72- and 96-



Fig. 2. Filmatic plain hydraulic grinding machine brought out by Cincinnati Grinders Incorporated

inch lengths. The five larger sizes have 15-H.P. motors for the grinding wheel spindle heads and 1 1/2-H.P. motors for the hydraulic systems. The two smaller sizes have 7 1/2-H.P. motors for the grinding wheel spindles and 1-H.P. motors for the hydraulic systems.

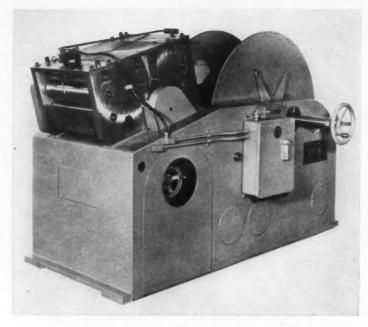
Thirty-one extra equipment items are available for these grinding machines. They include, an automatic electric gage sizing device with provision for continuous automatic compensation which eliminates the need for manual adjustments; contact fingers of the gaging mechanism that signal sizing information to the wheelhead retraction mechanism to assure consistent dimensional accuracy: and device for continuous compensation for wheel wear. The dual feed control enables the operator to select combination coarse and fine feed rates for the wheelhead to suit requirements.

Circle Item 120 on postcard, page 221

Multiple-Spindle Drill Head

A thirty-six-spindle drill head of special design, recently completed by the Thriftmaster Products Corporation, Lancaster, Pa., performs three operations on two dissimilar parts. This drill head is a complete unit, including drill bushing plate, index-table and fixtures. It performs drilling, reaming, and counterboring operations.

The four-station, ball-bearing index-table is manually operated, three stations being used for ma-



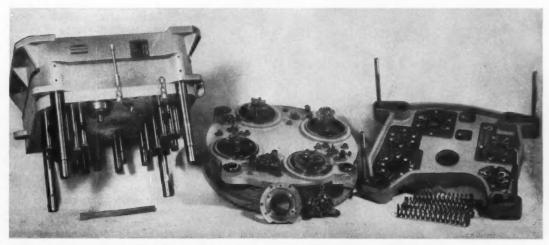
Combination cradle and straightener for coiled stock developed by Special Engineering Service, Inc.

chining and the fourth for loading and unloading. The approximate location of the index-plate is obtained by a spring-loaded plunger, the exact location being assured by four hardened rods which register with hardened bushings in the fixture. All thirty-six spindles have vertical and depth adjustment, and each spindle is operated at the desired speed. Lubrication is provided by a circulating oil pump.

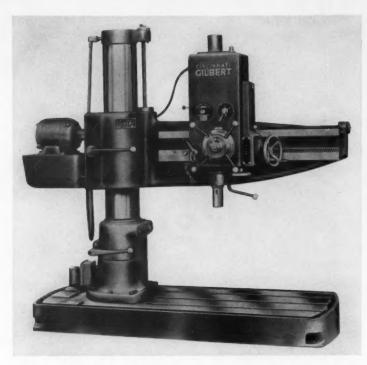
Circle Item 121 on postcard, page 221

Cradle and Straightener for Coiled Stock

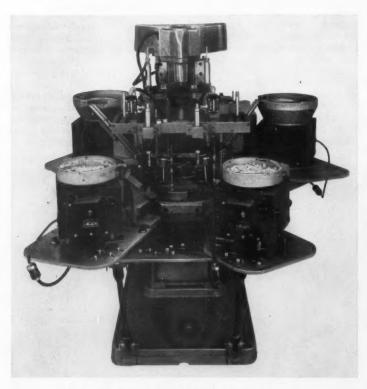
A combination cradle and straightener for coiled stock, with a number of improved features, has been developed by Special Engineering Service, Inc., Detroit, Mich. This equipment is available in models adapted for handling coils as large as 36 inches wide, 60 inches in diameter, and weighing 20,000 pounds. The cradle is available with either hardened rolls or



Special multiple-spindle drill head made by Thriftmaster Products Corporation to perform three operations on two different parts



Improved 11-inch radial drill with flame-hardened column, announced by the Cincinnati Gilbert Machine Tool Co.



Bodine tapping machine equipped for screw and nylon nut assembling job on headlamps

a slat conveyor for holding the coils and is driven through a variable speed reducer. The rate of stock delivery is easily adjustable to meet a wide range of speed requirements.

Rotating side plates which turn on Timken roller bearings prevent crimping or damaging the edges of the stock. Sealed ball bearings support the rotating plates, making it possible to adjust the unit for various coil widths, with very little effort. The straightener will handle stock up to 3/16 inch in thickness. It has two sets of power driving rolls and either five or seven straightening rolls.

Circle Item 122 on postcard, page 221

Cincinnati Gilbert Radial Drilling Machine

The Cincinnati Gilbert Machine Tool Co., Cincinnati, Ohio, is introducing a radial drill with a large-size flame-hardened column. This new feature is now available on 9- and 11-inch Gilbert radial drills as a protection against scoring. The special alloy castings for the 5-foot columns are finish-turned, then flame-hardened to 52-56 Rockwell C for a depth of 1/16 to 3/32 inch, and finally finish-ground to close tolerances for straightness, roundness, and high finish.

Circle Item 123 on postcard, page 221

Tapping and Assembling Screws and Nylon Nuts

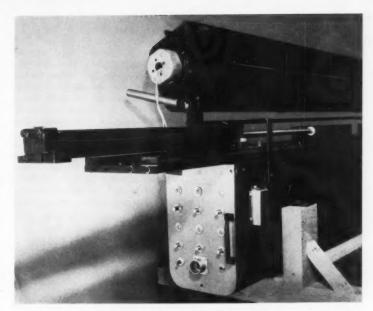
The Bodine Corporation, Bridgeport, Conn., solved both the economic and mechanical problems encountered in assembling headlamps by equipping a standard basic tapping machine with a dial feed and four automatic hopper feeds. Two hoppers deliver nylon nuts and two deliver screws to the assembly. With the machine operating at thirty strokes per minute, the hoppers deliver two nuts to the dial at each stroke and two screws are fed to the tapping stations. The screws are used as taps for the unthreaded nylon nuts and are driven into the nuts in twin operations which take less than two seconds. Accuracy of the screw and nut assembly is held consistently within one-half turn and the production rate is 3000 pieces each fifty-minute period.

Circle Item 124 on postcard, page 221

G-E Improved Pin-Hole Detector for Strip Steel

A redesigned unit for detecting pin-holes in strip steel, with a sensitivity five times greater than that of the former model, has been announced by the General Electric Co., Schenectady, N. Y. Under actual operating conditions, the new model will detect holes as small as 1 millimeter in diameter in opaque cold-rolled strip steel measuring 10 millimeters or less in thickness. Maximum sensitivity at strip speeds up to 2000 feet per minute is claimed and laboratory tests indicate that strip speeds in excess of 6000 feet per minute are possible.

Under ideal laboratory conditions the new detector will reveal holes as small as 0.5 millimeter in opaque strips. It will scan strip stock up to 48 inches wide and is equipped with a single mercury vapor lamp with a 25,000 footcandle output. Provision is made for checking the photo-tube while the equipment is in operation. This is accomplished by means of a small neon-light source and a



Pin-hole detector for strip steel announced by General Electric Co.

sensitivity adjustment device provided for the photo-tube.

Circle Item 125 on postcard, page 221

"Mill-M-Matic" Bed Type Production Milling Machine

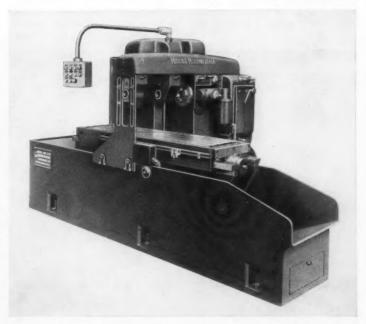
A "Mill-M-Matic," bed type milling machine embodying new design features is being built in plain and duplex models by the Motch & Merryweather Machinery Co., Cleveland, Ohio. The following description applies to the plain model machine.

The spindle is driven by a 25-H.P. motor having a speed of 1800 R.P.M. Spindle speeds range from 25 to 1230 R.P.M. and are obtained through change-gears. Table feeds at the rate of from 1 inch to 81 inches per minute are also obtained through change-gears. Rapid traverse of table is at rate of 243 inches per minute.

An involute spline is provided on the spindle for efficient power transmission regardless of the position of the quill. The quill is 8 1/4 inches in diameter and has a total adjustment of 6 inches. An electric brake clutch is mounted on the input shaft for automatic spindle stopping. This brake also serves as a spindle lock to facilitate tool removal. Automatic quill retraction, re-setting, and locking features can be supplied on new machines as well as on machines already in use.

Complete enclosure of the gear

train and the use of anti-friction tapered roller bearings throughout the spindle drive are design features of the machine. Heattreated alloy-steel precision gears and shafts are used to insure long life. Helical change-gears are employed to give smooth and quiet power transmission. Spindle speeds with a 50 to 1 ratio provide a total of 82 spindle speeds. The counter-weighted milling head has an alloy iron over-arm arbor



"Mill-M-Matic" production milling machine built by the Motch & Merryweather Machinery Co.

support with locks, which lends rigidity to the cutters. Rigid overarm brace and arbor support insure arbor accuracy. A pendant-mounted, push-button station gives full control of the machine.

The reinforced alloy iron bed has large coolant and chip compartments. The table has standard T-slots and the ways have nonmetallic liners with special lubrication and wiper features. The hardened-and-ground table feed-screw operates in a split nut which has an external backlash adjust-

ment. The table is designed for heavy-duty operation, including climb milling and the bedways have been extended to reduce overhang. The feed-box and table-drive mechanisms have automatic force feed lubrication. Central type coolant and chip disposal systems can be used.

Optional equipment and fixtures are available for special production runs. Extra attachments also include power head feed for automatic rise and fall operation.

Circle Item 126 on postcard, page 221

Monarch New Series "Preselector" Dyna-Shift Lathes

The Series 62 "Preselector" Dyna-Shift lathe built by the Monarch Machine Tool Co., Sidney, Ohio, announced in April, 1955, MACHINERY, page 226, is now available in twelve different models, designed to meet a large variety of precision turning requirements. All twelve models feature the "Preselector" Dyna-Shift headstock, and incorporate a four-way power rapid-traverse carriage and cross-slide.

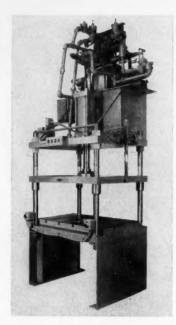
Two groups of models, the "thousand group" and the "hundred group," are available in this line. The "thousand group," of which Model 1100 is an example, includes more accessory equipment, such as an apron-controlled lead-screw reverse. The same pre-

cision workmanship, however, is found in both groups of machines. The Models 160, 161, 1160, and 1161 have a 20-H.P. main-drive motor, while Models 100, 101, 1100, and 1101 are equipped with a 10-H.P. motor.

Circle Item 127 on postcard, page 221

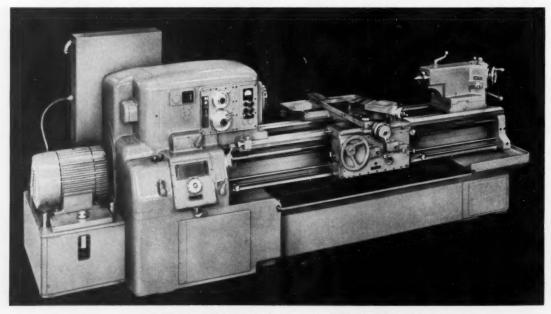
Self-Contained Four-Column Hydraulic Press

Hydraulic presses, built in a variety of platen sizes and strokes to suit customer specifications in a capacity range of from 25 to 100 tons, have been announced by the Paul Machine Tool & Die Works, Chicago, Ill. These self-contained, four-column presses are adapted



Paul self-contained four-column hydraulic press

for a variety of trimming, compression type molding, and sheetmetal forming operations. The press illustrated has a 14-inch stroke (with a four-second free cycle on a 10-inch stroke). It is constructed entirely of steel except for the four guide bearings on the moving platen which are



Monarch "Preselector" Dyna-Shift lathe now available in twelve models

of high-grade bronze. The three steel platens are precision-ground to very close tolerances for flatness and parallelism, and the four column holes are line-bored.

An inching adjustment is incorporated in the top platen to facilitate maintaining daylight top platen level adjustments. A precision-ground, heavy-duty bolster plate with T-slots is supplied as standard equipment. The moving platen is drilled to suit requirements.

The hydraulic unit is completely self-contained and is of the differ-

ential circuit type with high- and low-pressure pumps. A double-shafted motor is used with a pump coupling attached at each end. The hydraulic cylinder is a standard high-pressure type. The electrical system is completely interlocked with the hydraulic unit, and all controls are conveniently located. The push-button control station is mounted at the front center of the top platen. Two mushroom type palm-operated safety buttons are wired in series so that the press will operate on down stroke only.

Circle Item 128 on postcard, page 221

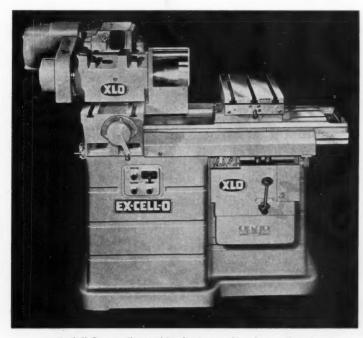
Ex-Cell-O Precision Boring Machine

Accuracy, versatility, and highproduction capacity are outstanding characteristics claimed for the Style 2112-B precision boring machine brought out by the Ex-Cell-O Corporation, Detroit, Mich. This small, single-end machine has a 12-inch table travel, and is designed to accommodate small- and medium-size work-pieces. A wide range of table feeds and speeds is provided by a newly designed hydraulic control panel. Dials that can be precisely adjusted control the feed rates in both directions of table travel. Smooth table movements, even during heavy machining cuts, are assured by automatic pressure compensation.

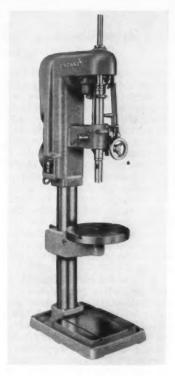
A heavy, well-ribbed, nickel-iron casting is used for the base. Precision spindles, isolated power assemblies, and a rigid machine base are designed to provide vibration-free performance and maintain precision. Fast traverse, spindle brakes, permanently lubricated spindles, and automatically lubricated ways are also features.

This machine can be provided with automatic work-handling equipment for "Bor-Drilling." It is well suited to tool-room work because of its accuracy and flexibility, and can be set up for production work with the controls locked for continuous reproduction.

Circle Item 129 on postcard, page 221



Ex-Cell-O versatile precision boring machine for small work



Stationary-head floor drill placed on the market by the Cincinnati Lathe & Tool Co.

Cincinnati Stationary-Head Floor Drill

The Cincinnati Lathe & Tool Co., Cincinnati, Ohio, is now building a 21-inch stationaryhead, floor type drilling machine, complete with motor and controls, which is ready to operate as soon as power leads are connected. This machine is equipped with a 1-H.P., 60-, 50-, or 25-cycle motor operating at speeds of 1800 or 1500 R.P.M. Spindle speeds available with direct drive are 400, 230, 145, and 85 R.P.M., and with back gear, 110, 65, 40, and 23 R.P.M. The distance from column to center of spindle is 10 5/8 inches. Travel of spindle by power feed is 10 1/2 inches. A depth gage, incorporating a positive stop, is provided to disengage the feed automatically. The four spindle feeds are 0.002, 0.005, 0.009, and 0.015 inch per revolution.

Distance between spindle nose and table is adjustable from 3 to 30 5/16 inches. The diameter of the table is 17 inches, and the working surface of the base, 16 1/4 by 17 1/2 inches.

Circle Item 130 on postcard, page 221

Colonial Broaching Machine Equipped with Shuttle Type Loading and Unloading Fixture

The Colonial Broach & Machine Co., Detroit, Mich., has adapted a standard Colonial RD 15-24 pull-down broaching machine for high-production handling of automobile differential ring gear blanks by the addition of a simple loading and unloading device.

Production at the rate of 300 gear blanks per hour is achieved by adding the shuttling, loading, and unloading device to the 15-ton, 24-inch stroke machine. The operation consists of broaching a bore accurately to size to insure proper location of the blank for the gear cutting operation that follows.

The hydraulically driven, shuttle type loading fixture shown in the illustration was devised, and mounted on the work-holding platen. Being a pull-down broaching operation, no auxiliary partholding clamps were necessary.

The operating cycle consists of: Loading the part in the fixture in the retracted position; energizing the cycle and moving the loaded fixture into the broaching position; starting broach downward stroke; engaging work-stroke puller, disengaging from automatic broach return puller and making the cutting stroke; and shuttling the fixture into the unloading and loading position as the broach is returned. The entire cycle, including manual loading and unloading, requires only twelve seconds.

Circle Item 131 on postcard, page 221

"Centra-Point" End-Mill Grinder

A new type grinder for endmills and other small tools has been developed by William H. Field Co., Inc., Boston, Mass. This machine, called the "Centra-Point" end-mill grinder, employs a simplified method for grinding helical cutters. Only a few simple adjustments are necessary to set up the machine. Clearance angles can be read directly from calibrations on the wheel-head assembly. Mechanical wheel dressing by built-in diamond truing tools insures an accurate wheel radius.

Accurate set-ups for grinding specific types of tools such as end-mills, milling cutters, and counter-bores are shown in an operating manual provided with each grinder.

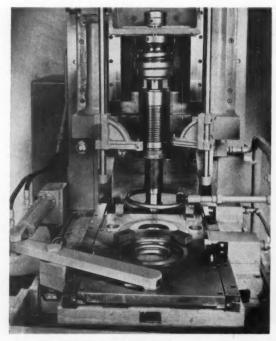
The collet will hold shanks up to 3/4 inch in diameter. Cutters up to 3 inches in diameter can be accommodated, and grinding wheels 2 inches in diameter can be used. The scale on the swivel head is graduated from 0 to 90 degrees and the clearance angle scale is graduated 15 degrees up and 15 degrees down from the zero point. The indexing mechanism accommodates cutters with one to six teeth, inclusive, and will also handle cutters having twelve teeth.

Circle Item 132 on postcard, page 221

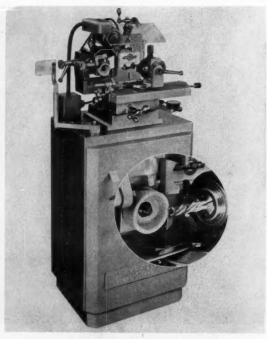
Drills of Various Types to Suit Specific Needs

Whitman & Barnes, Plymouth, Mich., have developed various types of drills to suit specific needs. Although the general-purpose "Hercules" drill made by this company takes care of most drilling operations, there are many metals and materials that can be drilled more efficiently by using one of the other types shown in the accompanying illustration.

"Hercules" jobbers' drills are obtainable in fractional, wire gage, and letter sizes for production drilling in cast iron, steel, steel forgings, and other materials.



Pull-down broaching machine with shuttling device for loading and unloading work



"Centra-Point" end-mill grinder developed by William H. Field Co., Inc.

6 TYPES OF HIGH SPEED JOBBERS, LETTER AND WIRE GAUGE DRILLS HERCULES—FOR GENERAL PURPOSE DBILLING BLUE DIAMOND—FOR GENERAL PRODUCTION DBILLING THROUGH EXPRINGS FASTWIST—FOR ALUMINUM DRI CAST METAL COPPER SLOWJWIST—FOR BARELITE BRASE, FREE AND HAZE STABLE BRYTWIST—FOR DBILLING IN SAFET METALS BOLTWIST—FOR DOLF AND COTTER PIN DRILLING

Drills made by Whitman & Barnes for different types of drilling work

"Blue Diamond" drills are made in fractional, letter, and wire gage sizes. These drills have been used in the small drill field, particularly in stationary machines and where drill bushings are employed. They cut freely and fast penetrating qualities make them suitable for deep-hole drilling.

"Fastwist" drills are obtainable in fractional, wire gage, and letter sizes. They are recommended for drilling deep holes in aluminum, magnesium, zinc and other diecast metals, and in materials of low-tensile strength. These drills perform best when operated at high speeds. They successfully drill stainless steels, copper, fiber, slate and marble at regular speeds.

"Slowtwist" drills may be obtained in fractional, wire gage, and letter sizes. They are designed for drilling Bakelite, brass, fiber, hard rubber, and various types of molded plastics. They are satisfactory for drilling certain types of soft wood when given a long point. The flutes and lands are highly polished to reduce friction. This facilitates chip ejection and prevents chips from fusing to the cutting lips and in the flutes.

"Brytwist" drills are available in fractional, wire gage, and letter sizes. They are designed for drilling sheet metals, airplane skins, and for other portable drilling work.

"Boltwist" drills are made in fractional, wire gage, and letter sizes. They have heavy webs for added strength and rigidity and are primarily intended for drilling stainless steels, cross-drilling bolt and cotter-pin holes, and other work requiring extra strong drills to avoid breakage.

Circle Item 133 on postcard, page 221

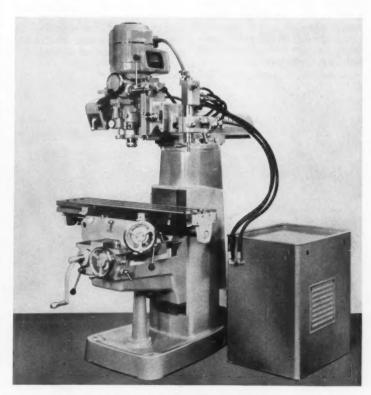
Cincinnati "Contourmaster" Tool and Die Milling Machines

Two styles of a tool and die milling machine designed for accurate, economical production of a wide variety of small-sized dies and molds have been brought out by the Cincinnati Milling Machine Co., Cincinnati, Ohio. These machines have been named "Contourmaster" because their basic field of operation is in the production of contour-shaped work, such as plastic molds, die-casting dies, forging dies, master hobs, and glass molds. Both machines are said to save production time, not only in the rapid completion of the actual operations, but also by reducing the amount of subsequent hand work required at the bench. They are equipped with hydraulic depth control for die-sinking operations, and manual table- and cross-feeds. Power drive and other equipment may be built in, converting them for automatic diesinking. In addition, a variety of tool-room milling equipment and attachments are available, including shaping attachment, precision measuring equipment, and small 8-inch swing dividing head.

Front-to-back swiveling of the spindle carrier and tracer mechanism are provided by mounting the spindle head on the front of the cross-ram in segmental circular ways which keep the tip of cutter and tracer close to their normal operating positions even when the head is swiveled to the maximum angular positions.

The Style 1A basic machine has a 16-inch table travel, Acme type feed-screws for table and saddle, and a feed handwheel at each end of table. The Style 1B machine has a 22-inch table travel, anti-friction ball bearing type lead-screws and nuts for table and saddle movements, and a front table control handwheel.

Both styles are equipped with an automatic, hydraulic, depth-control tracer mechanism coupled to the quill-mounted spindle. Vertical movements of the spindle are synchronized with table or saddle movements, under the control of a guiding template or master shape, to accurately reproduce even the slightest variations in surface contour. Tracer finger contact



"Contourmaster" tool and die milling machine announced by the Cincinnati Milling Machine Co.

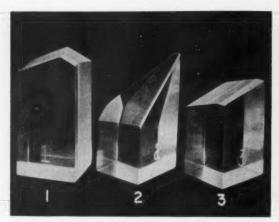


Fig. 1. Diamond tools for mirror-finish turning small precision work, announced by Hamilton Watch Co.

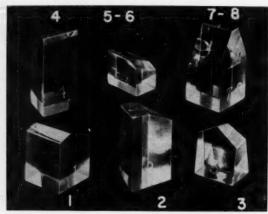


Fig. 2. Hamilton diamond tools designed for precision turning, countersinking, and chamfering

pressure is very light, permitting the use of wood, plaster, or other easily worked materials for the master shape.

Eight spindle speeds are available, ranging from 215 to 5650 R.P.M. Spindle drive is by multiple-step pulleys and V-belts. Speed changes are simplified by a knurled-knob belt tension adjustment. The spindle nose is of the collet chuck type, and collets are available for 1/4- to 3/4-inch diameter straight shank cutters, Nos. 5 and 7 B & S tapers, and Nos. 1 and 2 Morse tapers. A positive spindle lock simplifies cutter changing in the collet chuck.

Circle Item 134 on postcard, page 221

Hamilton Diamond Tools for Mirror-Finish Machining

The Allied Products Division, of Hamilton Watch Co., Lancaster, Pa., has announced a line of diamond tools for machining small precision work to extremely close tolerances and for producing a surface of mirror-finish smoothness. The line includes a number of tools, Figs. 1 and 2, for cutting-off and for finish-turning flat or beveled surfaces. It also includes a series of laps, Fig. 3, for machining the inside surfaces of holes, and discs and wheels for precision external machining.

The turning tools, Figs. 1 and 2, are available for any type of cut-

ting-off operation and for finishing flat or beveled surfaces to any angle. The laps are made in sizes varying from 0.018 inch to 2.250 inches in diameter. Wheels and discs are available up to 2.250 inches in diameter.

Although the tools shown in Figs. 1 and 2 are designed for specific operations on fine jewelry and watches, they can be used for many other fine precision machining jobs. The diamond tool (1), Fig. 1, is used to cut the outside corner of a jewel setting; tool (2) is made to cut the inside of the setting; and tool (3) is employed to cut the top of the setting. In Fig. 2, tool (1) is employed to rough-turn the diameter of a balance wheel; tool (2), to face the arm of the balance wheel; tool (3), to countersink screw holes; tool (4), to cut an inside chamfer; tools (5) and (6), to finish-cut the outside diameter and to face the balance wheel; and tools (7) and (8) are employed to cut the outside chamfer.

Circle Item 135 on postcard, page 221

Checking Unit Sorts Parts Automatically According to Surface Roughness

Equipment that permits surface roughness inspection in automation production set-ups has been announced by the Micrometrical Mfg. Co., Ann Arbor, Mich. This equipment sorts parts in accordance with the micro-inch roughness measured along cylindrical or

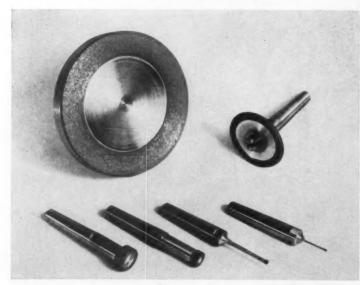
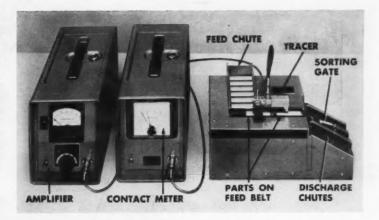


Fig. 3. Hamilton laps of metal-bonded diamond powder for internal grinding of hard metals and carbides

flat surfaces, including tapers and parts with grooves or shoulders.

The work-pieces go from a feed chute onto a conveyor belt which moves them beneath a "Profilometer" tracer. As the parts leave the tracer, they are automatically directed into an "accept" or "reject" discharge chute in accordance with their roughness. In the equipment shown, the contact meter is set to the high roughness limit; and parts that reach or exceed this limit are rejected. It can be furnished to accept work in a selected range of roughness.

Each application is engineered to suit individual requirements. However, each installation for use with external surfaces includes the basic elements identified in the accompanying illustration. In addition to the measuring-and-sorting equipment, the company can supply auxiliary items, including equipment for automatic selection of parts to be measured, such as every fifth or tenth part



Automatic "Profilometer" equipment for sorting parts

from the production line. Signal lights, and controls to shut down the line after a given number of parts are rejected, can also be supplied.

Circle Item 136 on postcard, page 221

"Stupalox" Ceramic Tools for Cutting Metals

An oxide-base cutting-tool material called "Stupalox," which has exceptionally long life and can be used at speeds up to 2000 surface feet per minute, has been developed by the Stupakoff Division of

the Carborundum Company, Latrobe, Pa. This cutting-tool material can be used effectively at slow as well as high speeds. For example, in a test, a 3-foot length of Nimonic 80-A (a material previ-

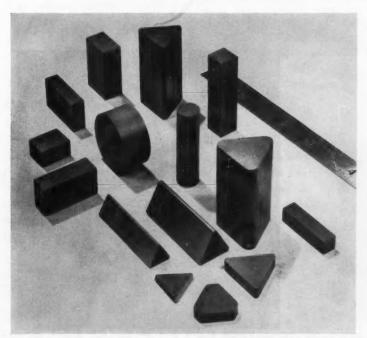
ously considered unmachinable) was machined by a "Stupalox" tool in four minutes without changing tools, at a surface speed of 40 feet per minute, cutting depth of 0.100 inch, and feed of 0.005 inch.

The new ceremic tool material

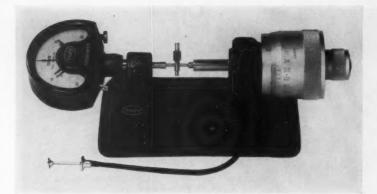
The new ceramic tool material will cut cast steel, cast iron, chilled iron, carbon steel, high-speed steel, and non-ferrous materials. Full production capacity of this material has not yet been determined, because machines of ample rigidity and motor power have not been available. In tests, high-speed steel (207-B annealed) was cut at a speed of 505 surface feet per minute with 0.023-inch feed and 0.125-inch depth of cut. In this case, the maximum cutting speed was limited by the machine. SAE 1035 steel was cut at a surface speed of 1175 feet per minute. In this test, the feed was varied from 0.015 to 0.005 inch and the depth of cut, from 0.005 to 0.250 inch to demonstrate the tool's versatility.

"Stupalox" is said to cut with no build-up on the cutting edge and no cratering adjacent to it. The operating conditions are basically the same as with other cutting tools. However, for best results, exceptional rigidity must be supplied, and the machine must have sufficient power to pull at optimum speeds. A special toolholder has been developed to permit full production from "Stupalox" inserts. A very smooth finish, often comparable to that obtained with commercial grinding, is said to be obtained with the new tool material. The tools can be ground with diamond wheels, using mechanical holding devices.

Circle Item 137 on postcard, page 221



"Stupalox" ceramic tools for cutting metals, announced by the Stupakoff Division of the Carborundum Company



Bench micrometer introduced by the George Scherr Co.

Bench Micrometer

An indicating bench micrometer with a non-rotating spindle has been introduced by the George Scherr Co., New York City. This micrometer is especially adapted for use in measuring small parts, such as instruments, wires, and screw machine products in the shop, tool-room, and electronic field laboratories. Spindle and anvil have bores for holding measuring spindles of different shapes.

The instrument measures by increments of 0.0001 inch directly from the dull chrome-finished micrometer thimble, which is 13/4 inches in diameter. The indicating head has 0.00005-inch graduations with a plus or minus range of

0.002 inch or a total range of 0.004 inch. As a comparator, it may be set without additional standards. A cable release retracts the anvil instantly for rapid repeat measurements. Zero adjustment is accomplished by means of a fine adjustment screw outside the housing. There are two tolerance hands which can be quickly adjusted to any desired plus or minus tolerance.

Circle Item 138 on postcard, page 221

Heavy-Duty Clutches

New type clutches designed specifically for heavy-duty service have been developed and fieldtested by engineers of the Rockford Clutch Division of Borg-Warner Corporation, Chicago, Ill. They are now available under the trade name "Morlife." The extra tough clutch plates incorporated have been developed for use in heavy-duty machines such as tractors, trucks, cranes, shovels, bulldozers, tanks, earth movers, graders, and other heavy machines. Only a comparatively light pressure on lever or pedal is required to engage and disengage the clutches.

Circle Item 139 on postcard, page 221

Lapping Machine for Carbide Tool Inserts

A self-contained, semi-automatic lapping machine, designed to grind carbide tool inserts and "throw-away" tools, is announced by the Empire Corporation, Milwaukee, Wis. This lapping machine uses readily available domestic abrasives in a fast, accurate grinding operation. It provides a finish on the hardest grades of carbides that is claimed to give as many or more cuts per tool than are obtainable with new inserts.

The lapping machine is semiautomatic in operation, requiring only loading and unloading. Toolholders are available to accommodate all standard triangular, round, and square inserts or

(Continued on page 208)



Heavy-duty clutch announced by Rockford Clutch Division, Borg-Warner Corporation



Empire semi-automatic lapping machine for finishing carbide inserts

so quick...so EASY...



So SIMPLE ...

Direct and quiet shifting into pre-selected speeds and feeds.



HYDRAULICALLY
PRE-SELECTS
all 18 feeds

Positive geared tap leads and feeds are quickly pre-set.

Super-Service Radials are available with complete hydraulic pre-selection of all 36 speeds and 18 feeds. Two convenient direct reading dials control the automatic shifting of sliding gears. While the tool is cutting, merely set the dials to the speed and feed for the next operation. As the spindle is stopping for inserting the next tool, the shifting is done hydraulically . . . directly, quietly and quickly. No other operations—no loss of time. Write for catalogs.



PRE-SELECTS
all 36 speeds

Speeds and tool diameters shown in large easy to read figures.

BICKFORD



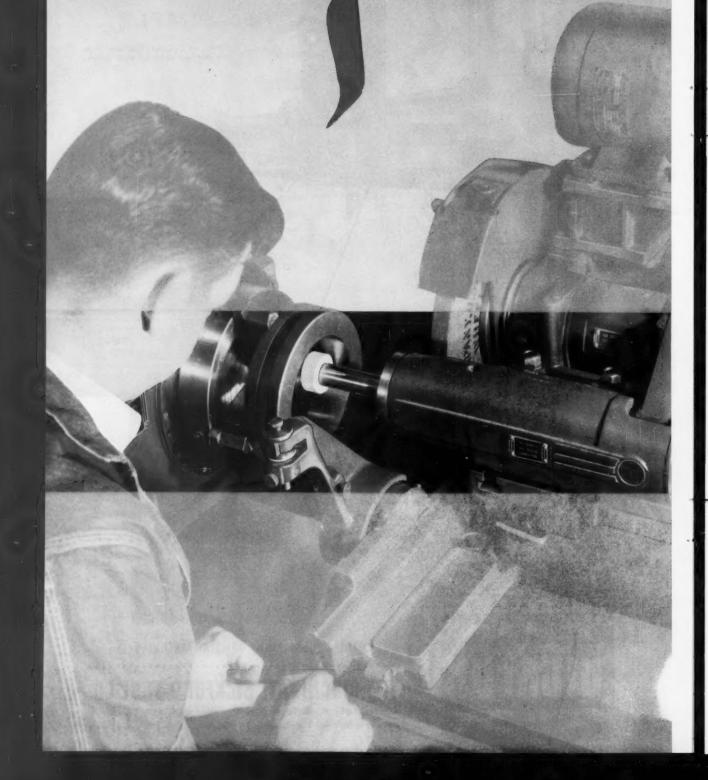
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Subsidiery of GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin.

The Most Efficient



Universal Grinders

New Brown & Sharpe Universal Grinding Machines are making new operating economy possible for internal and external grinding. For example, an exclusive Set-Diamond wheel truing attachment cuts dressing time on average internal jobs as much as 60%! It's an "optional" you'll want. Other outstanding exclusive features provide: instant combination of separate manual operations into full automatic cycles . . . external or internal grinding instantly available in any position . . . multiple-taper grinding at one set-up . . . and super-accuracy performance that makes sizing to 0.0001" routine! A unique combination of flexibility and accuracy - the perfect "bridge" between conventional universals and single-purpose machines. Four machine sizes — all available with ELECTRALIGN. Write for full details. Brown & Sharpe Mfg. Co., Providence 1, R. I.

...save
up to
60%
on
set-up
time!

Exclusive Time-Saver. Set-Diamond internal wheel truing attachment (optional) requires only one set-up at start of job. Stays on machine. Swings out of way during grinding — swings back for subsequent dressings. Only one wheel position for sizing complete job.

Brown & Sharpe 185

BUY THROUGH OUR PAY-AS-YOU-DEPRECIATE MACHINE TOOL PLAN

"throw-away" tools. Once loaded, the machine requires no further attention until the grinding operation is completed. It provides consistent and controlled micro finish on tools, with end sections maintained parallel and square to the axis of the tool.

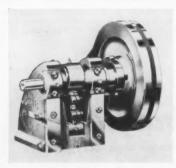
The machine is furnished with a set of three tool-holders, a charge of abrasive, and a loading fixture, ready for operation. The entire unit requires a bench space of only 18 by 24 inches and operates on 110-volt alternating current.

Circle Item 140 on postcard, page 221

Allen Two-Ton Half-Press

Alva Allen Industries, Clinton, Mo., have made available a Model B-2-A, two-ton half-press which can be conveniently adapted for any punching, shearing, forming, riveting, blanking, cutting, or drawing operation. In addition to performing operations on metal parts, this half-press can be used on materials such as leather, fiber. plastics, textiles, and paper. As a half-press unit, it can be mounted on the purchaser's own column and base. With this arrangement any desired space can be left below the half-press unit to accommodate the work. On continuousoperation work, the press will perform up to 300 operations per minute.

Outstanding features include a quick-action, single-pin clutch with simple, positive, non-repeat or repeat action; straight ram guides with flat gib, giving accurate fitting of dies for precision stamping; and accurate ram adjustment with simple, positive lock. The standard stroke is 3/4 inch with 1/4- to 1 1/2-inch strokes available at an additional



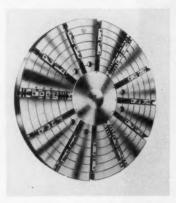
Two-ton half-press introduced by Alva Allen Industries

cost. The V-belt drive requires only a 1/3-H.P. motor. The halfpress weighs only 75 pounds.

Circle Item 141 on postcard, page 221

Chuck with Controlled Centering Pressure

Accurate repetitive centering of work within a total indicator reading of 0.0005 inch is possible with a chuck having controlled centering pressure, brought out by Horton Chuck, Division of E. Horton & Son Co., Windsor Locks, Conn. This chuck is designed for rapid operation and for elimination of



Horton chuck with controlled work-centering pressure

work distortion caused by excessive centering pressure. It is available in sizes ranging from 34 to 54 inches in diameter for direct spindle and table-top mountings.

All the standard chucks have twelve equally spaced independent pinch units that close in on the work and three equally spaced universal centering jaws. The number and radial spacing of the jaws can be varied to suit applications. Standard soft blank top jaws are available in five heights ranging from 1 1/2 to 5 inches.

Circle Item 142 on postcard, page 221

Miniature Cap-Screws

A complete line of miniature, hexagonal-socket cap-screws and set-screws, ranging in size from No. 0 to No. 3, and in lengths of from 1/8 to 1/2 inch, is announced by the Allen Mfg. Co., Hartford, Conn. These screws are manufactured in both the coarse- and fine-thread series except for the No. 0



Allen miniature hexagonalsocket cap-screws

and No. 1 sizes, which are made only in the fine-thread series.

These small screws, called "minicaps" and "minisets," have been developed to provide the advantages of dependable hexagonalsocket fastening screws for a wide variety of very small devices, instruments, and other products.

Circle Item 143 on postcard, page 221

"Lubrikit" Assortment of Oil-Cups

A boxed assortment of ninety-five oil-cups of twenty-nine different types designated "Lubrikit" has been brought out by Gits Bros. Mfg. Co., Chicago, Ill. The oilers in this kit are the ones most used for maintenance and replacement throughout industry. Each type of oiler comes in a separate bin within the kit. Contents of each bin are fully and clearly described on the inside of the cover.

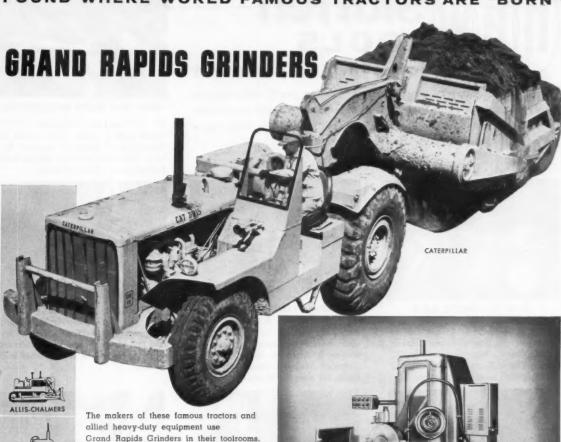
Circle Item 144 on postcard, page 221

(This section continued on page 215)



Gits "Lubrikit" assortment of oilcups for replacement service

FOUND WHERE WORLD FAMOUS TRACTORS ARE "BORN"



The makers of these famous tractors and allied heavy-duty equipment use Grand Rapids Grinders in their toolrooms. In fact, you'll find Grand Rapids Grinders wherever manufacturers place a premium on precision . . . because they're designed and built for lifetime precision grinding.

Take our Model 560, shown at right. Its column and base are a massive, one-piece casting for permanent, rigid alignment. Wheel head has powered rapid vertical travel; cross feed and longitudinal travel table are hydraulically actuated. Table speed is variable up to 140 fpm, making this the *lastest* grinder of its type and size!

If you're not already enjoying these standout features in your toolroom, a note on your letterhead will bring full details.



GRAND RAPIDS No. 560 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 140 fpm. Working surface of table is 14" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1800 and 2140 rpm.





GALLMEYER & LIVINGSTON CO.

Write for full information.



305 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

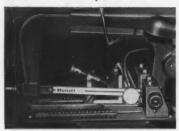
for every department

In the big new Starrett 75th Anniversary Catalog you'll find many new tools like these... plus thousands of other items to help you do precision work faster, better and at less cost. Ask your Starrett Distributor or write for your free copy. Use the coupon.



NEW MAGNETIC BASE INDICATOR HOLDER

No. 657 holds firmly to any iron or steel surface. Use with any Starrett "Last Word", No. 196 or No. 25 Series dial indicator. Universally adjustable with on-off push button.



NEW HACKSAWS, BAND SAWS, **HOLE SAWS and BAND KNIVES** are Production-Proved for better cutting, longer life. Starrett hacksaws are now color-identified to help select the right blade for any job.



NEW STAINLESS STEEL RADIUS GAGES

No. 167. Sets of individual gages, each with five gaging surfaces for convex or concave radii. Made of rustproof stainless steel with Satin Finish. Six convenient sets.



PRECISION GROUND FLAT STOCK

and Die Stock saves valuable machine and man hours. Available in oil, oil or water, water hardening or air hardening types. "Just lay it out . . . and saw it out."



NEW ODD FLUTE MICROMETERS

No. 483 and No. 485 measure 3 or 5fluted cutting tools. Read direct in thousandths, eliminate special fixtures. Satin Chrome Finish with carbide facings on anvil and spindle.



NEW DIAL TEST INDICATORS like this No. 675 simplify layout, production and inspection. And don't forget the complete new line of Starrett high precision-low friction dial indicators.



NEW "KLEENSCRIBE" LAYOUT DYE

is specially prepared for layout work. Dries instantly to an opaque, no-glare blue finish. Makes scribed lines stand out sharp and clear. 4 fluid ounce can with brush in cap.



SINCE 1880 WORLD'S GREATEST TOOLMAKERS

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS DIAL INDICATORS . STEEL TAPES
PRECISION GROUND FLAT STOCK DIAL INDICATORS . HACKSAWS, BAND SAWS and BAND KNIVES

> THE L. S. STARRETT COMPANY Athol, Massachusetts, U.S.A.



BI	G	NE	W	CA	TA	L	0	G

75th Anniversary Edition Describes and illustrates over 3000 Starrett Tools including 85 new tools. Send the coupon below for your FREE COPY.



THE L. S. STARRETT COMPANY

Dept. D, Athol, Mass., U. S. A.

Please send my free copy of the big, new Starrett 75th Anniversary Catalog

Company.....

FORMULAS FOR CALCULATING REPLACEMENT HELICAL GEAR DIMENSIONS FROM EASILY MADE MEASUREMENTS

Tooth Form and Pressure Angle	Normal Diametral Pitch P _N	Diametral Pitch	Outside Diameter of Blank	Pitch Diameter	Cosine of Helix	Addendum	Dedendum	Whole Depth
American Standard 14 1/2- and 20-de- greefull depth	$\frac{N+2\cos A}{O\times\cos A}$ $\frac{O\times\cos A}{P}$ $\cos A$	$P_{\rm w}\cos A$ or $N + 2\cos A$ O	$N + 2 \cos A$ $P_{N} \cos A$ Or $N + 2 \cos A$ P	$\begin{array}{c} N \\ P_{\text{N}} \cos A \\ \text{or} \\ N \\ \end{array}$	$\begin{array}{c c} P \\ P_{\kappa} \\ \text{or} \\ N \\ O \times P_{\kappa} - 2 \end{array}$	$\frac{1}{P_{N}}$ or $\frac{Or}{P}$	1.157 P _M or 1.157 cos A P	$ \begin{array}{c} 2.157 \\ P_{\text{N}} \\ \text{or} \\ 2.157 \cos A \\ P \end{array} $
American Standard 20-degree stub	$N+1.6\cos A$ $0\times\cos A$ or P $\cos A$	$P_{\text{sr}} \cos A$ or $N + 1.6 \cos A$ 0	$N + 1.6 \cos A$ $P_n \cos A$ or $N + 1.6 \cos A$	$\begin{array}{c} N \\ P_{\text{M}} \cos A \\ \text{or} \\ N \\ \end{array}$	$\begin{array}{c} P \\ P_{\kappa} \\ \text{or} \\ N \\ O \times P_{\kappa} - 1.6 \end{array}$	$\begin{array}{c} 0.8 \\ P_{\rm N} \\ \text{or} \\ 0.8 \cos A \\ P \end{array}$	$\frac{1}{P_{s}}$ or $\frac{\cos A}{P}$	$ \begin{array}{c} 1.8 \\ P_{\scriptscriptstyle N} \\ \text{or} \\ 1.8 \cos A \\ P \end{array} $
Fellows 20-degree stub			$\frac{N}{(P_{\rm B})_{\rm B}\cos A} + \frac{2}{(P_{\rm B})_{\rm D}}$	$\frac{N}{(P_{\scriptscriptstyle R})_{\scriptscriptstyle R}\cos A}$	$\frac{N}{(P_{\rm B})_{\rm B}\left(O-\frac{2}{(P_{\rm N})_{\rm D}}\right)}$	$\frac{1}{(P_{\rm N})_{\rm N}}$	$\frac{1.25}{(P_{\rm N})_{\rm W}}$	2.25 (P _N) _N
Nuttall 20-degree stub	$\begin{array}{c} N+1.5708\cos A \\ O\times\cos A \\ \hline OV \\ OV \\ COS\ A \\ \end{array}$	$P_{\text{s}} \cos A$ $N + 1.5708 \cos A$ O		N P _N cos A or N P	$\begin{array}{c c} P \\ \hline P_{\rm N} \\ \text{or} \\ N \\ \hline O \times P_{\rm H} - 1.5708 \end{array}$	$ \begin{array}{c} 0.7854 \\ P_{N} \\ \text{or} \\ 0.7854 \cos A \\ P \end{array} $	$\frac{0.9424}{P_{N}}$	$\frac{1.7278}{P_{\rm N}}$ or $1.7278 \cos A$ P

plunger on the face of the tooth-it can be anywhere between the outside diameter and the root of the

5. With the machine completely shut off and the starting lever engaged, run the vertical swivel head down by means of the handwheel. 1. Using a common protractor, measure helix angle A at the approximate pitch line. Usually this

hobbing machine.

and set up the hobber as though ready to cut the gear. for the angle believed to be the correct helix angle 3. Calculate the index and lead gears differentially

or fraction of a degree can then be determined by a simple trigonometric equation. The second set of cator will remain at the 0 degree position during the 6. If the correct angle has been selected, the indientire travel. If it runs out slightly, then note the amount of run-out in thousandths of an inch for the length of face. The amount of deviation in degrees calculated change-gears will no doubt be exact. Compiled by Robert J. Kaiser, Penn Machine Co., Johnstown, Pa.

Simplified Means of Obtaining the Exact Helix Angle A of Gear to be Duplicated

angle will be something on the order of 5, 7 1/2, or 10 degrees.

2. Place sample or its mating gear on arbor of gear

4. Mount a common indicator on the vertical swivel head with an adjustable arm, and place the indicator

= normal diametral pitch in numerator of stub-tooth designation, which determines thickness of tooth and number of teeth; normal diametral pitch in denominator of stub-tooth designation, which determines the addendum, dedendum, and whole depth.

= number of teeth;

= outside diameter of blank;

Q

= normal diametral pitch;

= diametral pitch; = pitch diameter; = helix angle; PN is pitch of cutter or hob used to cut teeth

AMERICAN STANDARD MACHINE PINS-1

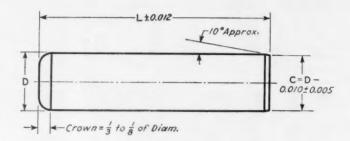


Table 1. Dimensions of Hardened and Ground Dowel Pins

					Nominal 1	Diameter	D			
	1/8	3/16	1/4	5/16	3/8	7/16	1/2	5/g	3/4	7/8
				Diameter	Standa	rd Pins	±0.0001			
Length,	0.1252	0.1877	0.2502	0.3127	0.3752	0.4377	0.5002	0.6252	0.7502	0.8752
				Diamete	r Oversi	ze Pins	±0.0001			
	0.1260	0.1885	0.2510	0.3135	0.3760	0.4385	0.5010	0.6260	0.7510	0.8760
1/2	Х	Х	Х	х						
5/8 3/4	Х	X	X	X						
3/4	X	X	X	X	X					
7/8	X	X	Х	Х	х	X				
1	x	x	x	x	x	х				
1 1/4		X	X	x	X	X	x	x		
1 1/2		X	X	X	X	x	X	X	X	
1 3/4		X	Х	х	X	X	Х	x	х	
2		x	x	x	x	x	x	x	x	x
2 1/4				X	X	X	X			
2 1/2				X	X	X	X	Х	X	Х
3							X	х	X	X
3 1/2							X	х		
4							x	x	x	x
4 1/2								X	X	X
5									X	X
5 1/2									X	X

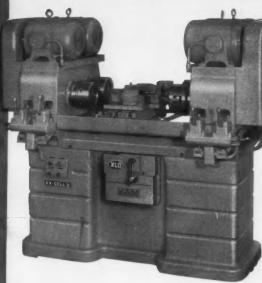
All dimensions are given in inches.

These pins are extensively used in the tool and machine industry and a machine reamer of nominal size may be used to produce the holes into which these pins tap or press fit. They must be straight and free from any defects that will affect their serviceability.

Extracted from ASA B5.20-1954 with permission of publisher, American Society of Mechanical Engineers



STYLE 2112-B. Single-end model for work pletos in the small and medium-size range. Flexible hydraulic centrols give



STYLE 1212-B. For identical or different operations at each loading time of parts approximates the time of machining, a double-end machine practically doubles production.



STYLE 112-D. Large and sturdy with long stroke. Accommodates medium and heavy work, gives maximum precision production, minimum operating cost.



Ex-Cell-O Precision Boring Machines



STYLE 17-A. Massive construction. Main-taine the highest precision standards on a profitable production basis. Economical

You can precision-bore, turn, face, counterbore, chamfer, or groove with these fast, sturdy, flexible EX-CELL-O machines.

These are standard machines that handle many kinds of precision operations. EX-CELL-O has the standard items of tooling to make this possible at minimum cost.

Any EX-CELL-O Precision Boring Machine will give you precision work at maximum production speeds, with a minimum of investment.

Get all the facts about them from your local Ex-Cell-O representative, or write for a Precision Boring Catalog.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS . GRINDING SPINDLES CUTTING TOOLS . RAILROAD PINS AND BUSHINGS . DRILL JIG BUSHINGS AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS . DAIRY EQUIPMENT

ANOTHER EXAMPLE of REDUCING COSTS WITH-

ECONOMATION

Performs 23 operations every 18 seconds on automotive intake manifold!

> This Buhr 5-way dial-type hydraulic-feed Special mills, drills, countersinks and individual-lead-screw taps 206 intake manifolds an hour gross.

The Machine is equipped with a Buhr 60"-diameter 6-position automatic index table, complete with shot bolt.

Chips are disposed automatically by means of a rotating chip conveyor.

Parts are loaded one per station in each of the six single-place fixtures. Power wrench with torque-control, automatically operates clamping mechanism.

Buhr's precision manufacturing methods provide complete interchangeability of all parts and component assemblies.



Suhr HIGH PRODUCTION MACHINERY See what Buhr Economation can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.

Solidly Engineered • Precision Built • for World's Leading Manufacturers



Chicago-Latrobe carbide gun drill for shallow and deep holes

Chicago-Latrobe Carbide Gun Drills

Chicago-Latrobe, Chicago, Ill., is now manufacturing carbide gun drills for use in drilling both shallow and deep holes. The application of these drills falls in two general classifications referred to "bore-drilling," here as and "rifle-drilling," commonly called deep-hole drilling. In "bore-drilling," the gun drill is employed as a boring tool and is used in an accurate high-speed boring or drilling spindle. The tool is rotated making it possible to bore-drill short holes accurately and economically. The bore-drilling technique can also be used for deephole drilling in cases where it would otherwise be impractical to use a drill.

In rifle-drilling or deep-hole drilling, the gun drill is used in commercially available special deep-hole or rifle-drilling machines. The work is rotated while the stationary drill is fed into the work. In both bore-drilling and rifle-drilling, high cutting fluid pressures are required and a uniform feed rate must be maintained. The cutting fluid pressures generally used vary from 250 to 800 pounds per square inch. The feed rate is dependent upon the material and other operating variables.

Advantages claimed for the new carbide gun drills include reduced cost, resulting from the elimination of a regular drilling, boring, and reaming operation; reduction of run-out and the maintenance of closer size tolerances; production of a fine finish; higher production and increased tool life; and the bore-drilling of deep holes in materials that are difficult to machine.

These gun drills are now available in sizes ranging from 1/4 inch to 1 1/2 inches, inclusive, for bore-drilling applications and in sizes from 1/4 to 1 inch, inclusive, for deep-hole (non-rotating) applications. Sizes from 1/4 to 19/64 inch are furnished with solid carbide heads while sizes from 5/16 to 1/2 inch are available with either solid carbide heads or with

carbide-tipped heads. Sizes over 1/2 inch in diameter are provided with carbide-tipped heads.

Circle Item 145 on postcard, page 221



Brier-Mist collant system unit

Mist Coolant System for Machine Tools

A controlled spray of coolant delivered to the right spot in the right amount and of a consistency that does not vary regardless of "off-on" interruptions is a feature claimed for an air-operated coolant system introduced by

Brier-Mist, Division of Brierley D., Inc., Oak Park, Ill. With this system, the coolant can be directed at the cutting point of the tool at a steady flow rate of 2 quarts per eight-hour period.

Three different units are available to suit the requirements of various machines and types of work. The unit shown in the illustration can be furnished with up to four nozzles.

Circle Item 146 on postcard, page 221

Storage Wall System for Stocking Small Parts

A storage wall system, consisting of nests of drawers that can be stacked together in buildingblock style to form a self-supporting structure, has been introduced by the Standard Pressed Steel Co., Jenkintown, Pa. This storage equipment provides a new degree of utility and flexibility in the stocking of small parts. Units of this Hallowell storage wall can be bolted together to form an office partition; mounted above or beneath shop work benches for onthe-job location of tools and parts; and inserted within standard shelving and counter units. The system permits the use of three different drawer widths in the same case. The drawers are designed for nesting and can be removed and stacked for shipment throughout the plant.

Circle Item 147 on postcard, page 221



Hallowell storage wall equipment for stocking small parts introduced by the Standard Pressed Steel Co.

Jarvis Pipe Taps

High-speed steel, ground-thread pipe taps with standard hand tap shanks for tapping attachment ap-



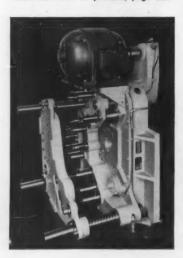
plication are now manufactured by the Jarvis Corporation, Middletown, Conn. By using the longer standard hand tap shank, chucking problems sometimes presented by conventional stub pipe tap shanks are avoided. Made in 1/8, 1/4, 3/8, and 1/2 inch sizes.

Circle Item 148 on postcard, page 221

Thriftmaster Special Multiple-Spindle Drilling and Tapping Head

Special fixed-center multiple-spindle drilling and tapping head with spring-loaded suspended drill-bushing plate recently built by Thriftmaster Products Corporation, Lancaster, Pa. This head is designed to meet the customer's requirements for simultaneously drilling and tapping of parts in a machine equipped with a rotary indexing table. The head has nineteen spindles, eleven of which are employed for drilling and countersinking. The other eight spindles are used for lead-screw tapping and are driven by a separate motor mounted on the housing of the head. All spindles are geared to operate at the correct speed for the operation being performed.

Circle Item 149 on postcard, page 221



Speed Reducer for Conveyor Drives

A combination helical and worm gear "HVUT" speed-reducer drive has recently been developed for use in overhead, trolley, floor, and pit type conveyors, and for similar industrial applications by Philadelphia Gear Works, Philadelphia, Pa. It can be mounted with the output shaft horizontal or vertical (either up or down), and the input shaft at the horizontal right angle. This feature permits ready integration into virtually any drive application. Ratios available are from 50 to 1 up to 1800 to 1. If necessary, changes in output speed can be made quickly and easily by changing the helical gears within the unit. The units



are completely enclosed, yet all components are accessible for inspection or replacement. "Dry well" construction prevents oil leakage around the output shaft—even in the vertical-down position. Electro-mechanical shut-off devices for torque or overload protection can be furnished.

Circle Item 150 on postcard, page 221

Solenoid-Operated Valve for Hydraulic Circuits

Single solenoid, pilot - operated hydraulic valve for automatic control of hydraulic circuits announced by Rivett Lathe & Grinder, Inc., Boston, Mass. This Model 6615 Rivett valve is the sub-plate type for panel mounting, and is conservatively designed for a pressure of 3000 pounds per square inch. It is available in 1/2-, 3/4-, 1-, 1 1/4-, and 1 1/2-inch sizes; meets all J.I.C. requirements; and has a capacity rating of 3.6 gallons per minute at 15 feet per second. Low pressure drop permits operation at maxi-



mum efficiency. The solenoid is the heavy, shock-resistant, continuous-duty type, operating on 3.6 amperes inrush and 0.45 amperes holding current at 115 volts.

Circle Item 151 on postcard, page 221

Bryant Groove Gage

Bryant Gage & Spindle Division, Bryant Chucking Grinder Co., Springfield, Vt., is introducing its portable groove gage in a low-cost package complete with sets of segments. The gage has no bearings or slides to wear, all movement being confined to spring-steel reeds. Segments move radially to engage the groove diameter; the nose bears vertically on the bottom face of the groove. A dial indicator gives fast, simple determination of acceptable parts or rejects. There are eight pairs of segments. Four basic pairs serve 0-ring grooves through a 5-inch diameter; the other four check snap-ring grooves up to a 5-inch diameter. Dovetail clamps give each pair an adjustment range through 2 inches.

Circle Item 152 on postcard, page 221



For general all 'round gaging

You can't beat a Dial Indicator



With all the fanfare about new and fancy gaging systems, the Dial Indicator is today the most universally used visual gaging instrument. It is exceedingly economical and practical because -

It is the most adaptable means of gaging

Low in first cost, and maintenance

No bothersome electric cables or air tubes; no prob-lem of dirty air lines, filters, etc.

Dependably accurate up to .0001" and sometimes to .00005"

Faster than a fixed gage

Shows at a glance how you are doing

Requires no expensive special masters

Federal Dial Indicators outsell all others, for Federal is the most complete line in the world. You can get anything you need in magnification, range, size, and style. There are specially modified Indicators — shockproof, wetproof, superaccurate — and all wanted attachments. Our Catalog tells the whole story. Ask for a copy today.

> FEDERAL PRODUCTS CORPORATION 6111 EDDY STREET . PROVIDENCE 1, R. I.

And for a Dial Indicator

You can't beat a



FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic - for Inspecting, Measuring, Sorting, or Automation Gaging



Two Dial Indicators measure Two Dial Indicators measure thickness of sheer glass close to its edge. Equipped with magnetic maximum hands, one registers maximum and the other minimum thickness. Rollers contact both sides of glass to assure smooth movement.



Model 88P Gage uses Dial Indicators graduated .001", .0005", and .0001" to inspect accuracy of shallow diameters, either I.D. or O.D. Gage is adjustable for various diameters and for height.



Two Federal Testmasters check the flatness of the cone surface of a water meter housing mounted on a Sine Bar and the height of the ball with reference to the surface.



This Gage employs dead weight pressure in two directions to check by a single .0001° Dial Indicator the radial play of as-sembled ball bearings.



Meaty Message Reprinted

The July editorial written by MACHINERY'S Editor, Charles O. Herb, on the work of the Hoover Commission became the guest editorial in August Products Finishing. Mr. Herb gave it the eye- and stomach-catching title, "Hamburgers and Tomatoes."

Plane Pinching

Designed with its middle tucked in, the new type of supersonic airplane will increase its speed up to 25 per cent without any increase in engine power. The silhouette has been referred to as "wasp-waist," "Coke - bottle," and "Marilyn Monroe." But the man who de-

veloped it, Richard T. Whitcomb, of the National Advisory Committee for Aeronautics, prefers to call it the "indented" shape, according to The New York Times. However referred to, the principle is easily understood. Didn't you move faster with a 26-inch waistline?

No Riders at All

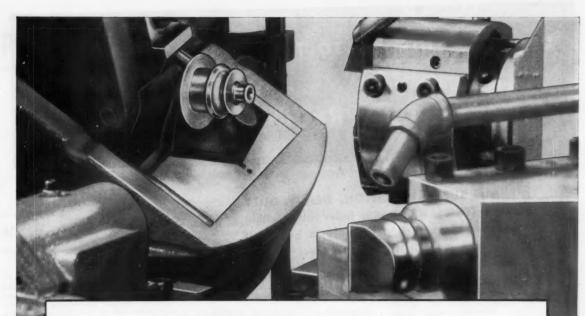
A Guide-O-Matic tractor is on the market which moves trailer trains to prescribed destinations without an operator. This industrial tractor, developed by Robert Deliban, uses a guide wire which transmits radio waves to a 'sniffer" box mounted on the tractor. Just press a button on a signal box to call for the tractor.

For Faster Facts

With the installation of Univac at its Niagara Falls executive office, The Carborundum Company is planning to operate a new electronic data processing system. What is Univac? We quote: "Univac is a giant electronic brain that calculates with the speed of electrons and has a magnetic memory that will tell us (Carborundum) the quantity and inventory location of any abrasive product we make; it will figure the payroll, compute costs, put a customer's order in the plant, figure out a mathematical problem for research in less time than it takes to explain it." At this point, can we add "More power to it?"



A METAL ROLLING PIN was placed in the hands of this attractive young lady at the Machine Tool Show held last Fall in Chicago, with the instructions "Go ahead—and check it." The connecting-rod straightener, made by the Sheffield Corporation (this you can see by shifting the eye ever so to the left), is normally used to "inspect" connecting-rods, to recompute amount of pressure and direction in which it should be applied in correcting them; and to make the correction.



From PROBLEM to PROFIT

in just 3.59 minutes ... with a

POTTER & JOHNSTON 6DRE-40

Automatic Chucking Turret Lathe

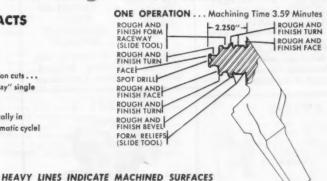
HERE ARE THE FACTS

PART: Cutter Bit Arm

MATERIAL: 4812 Steel Forging

REQUIRED: 18 separate, precision cuts . . . including some "fussy" single point form turning.

COMPLETED: Quickly, economically in 1 completely automatic cycle!



And remember, this is not an exceptional, "donefor-the-record" case history. It's a regular production job that typifies the day-in-day-out performance you can count on because a P&J 6DRE-40 has the advanced design, added rigidity, extra speed Write today for your free copy of and power, and versatility to take tough jobs in stride. And when you team this P&J Automatic with tooling engineered by P&J Specialists, you

really have a cost cutting, profit building combination.

SEND NOW FOR COMPLETE INFORMATION

Bulletin No. 159 describing the P&J 6DRE-40 in detail. Complete engineering data is included.

Precision Production Tooling for more than Fifty Years

POTTER & JOHNSTON COMPANY

PAWTUCKET, RHODE ISLAND SUBSIDIARY OF PRATT & WHITNEY COMPANY, INCORPORATED

MODERNIZE WITH POTTER & JOHNSTON . . . REPLACE FOR PROFIT

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-219

LOOK AT THIS UP-TO-THE-MINUTE EXHIBIT OF

PRECISION SPINDLES

EXHIBIT A

BORING SPINDLES for boring holes round within millionths of an inch. Available in both belt driven and motorized units to meet a wide range of speeds and horsepower. Send us your specifications for quotations.



EXHIBIT B



POPE 1 HP, TOTALLY ENCLOSED 3600 RPM MOTORIZED, CARTRIDGE TYPE PRECISION SPINDLES with double row cylindrical roller bearings and separate thrust bearings for no endwise movement of the shaft

EXHIBIT D



POPE

HEAVY DUTY,
3/4 TO 100 HP
DIRECT
MOTORIZED
SPINDLES

for Horizontal or Vertical Skin Milling, Grinding, Milling, Boring and Other Operations EXHIBIT F



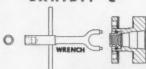
POPE HEAVY DUTY VEE-BELT DRIVEN, PRECISION MILLING SPINDLES, and Wheel Heads, ½ to 50 HP

EXHIBIT G



GRINDING SPINDLES for Bryant, Excello, Heald and Landis Grinders.

EXHIBIT C



NEW POPE QUICK, SELF-REMOVING WHEEL HOLDER

for surface grinders and tool and cutter grinders — eliminates the necessity of a wheel puller. Write for quotations. EXHIBIT E



POPE SUPER-PRECISION MOTORIZED TOOL AND CUTTER GRINDER SPINDLES with clearance Angle Swiveling Heads for Angular Adjustment In A Vertical Plane

EXHIBIT H



POPE SUPER-PRECISION
HIGH FREQUENCY HEAVY
DUTY GRINDING AND
MILLING SPINDLES
for speeds up to 100,000 RPM

for speeds up to 100,000 RPM No. 107

WRITE FOR COMPLETE SPECIFICATIONS, PRICE AND DELIVERY

Specify

POPE

PRECISION SPINDLES-

POPE MACHINERY CORPORATION

Established 1920

261 RIVER STREET * HAVERHILL MASSACHUSETTS

220-Machinery, January, 1956

For more information fill in page number on Inquiry Card, on page 221

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Cards for further information
On New Catalogues described in this issue of MACHINERY
On New Shop Equipment described in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

CARBIDE TOOLS—Union Twist Drill Co., Dept. CNR, Athol, Mass. Catalogue CC, containing 64 pages of technical information concerning recent developments and additions to the company's line of carbide drills and cutting tools. Copies are available by writing on a company letterhead directly to the Union Twist Drill Co.

COLD ROLL-FORMING — Yoder Co., Cleveland, Ohio. Fourth revised edition of a book on cold roll-forming, designed primarily as a textbook on the function, scope, and economies of cold roll-forming. Many illustrations have been added showing interesting uses of roll-formed shapes. Discussed are cold roll-forming equipment and end uses of its products; advantages and commercial possibilities; auxiliary equipment for curving, coiling, ring-forming, nothing, perforating, welding, embossing, automatic cutting off, and other operations incorporated on cold-forming production lines.

STAINLESS FASTENERS—Allmetal Screw Products Co., Inc., Garden City, N. Y. 52-page comprehensive data book on stainless fasteners. Thumb-indexed for easy reference and illustrated, the booklet gives thread and size specifications and availability in a variety of corrosion resistant metals of forty basic fastening devices, Engineering data relating to the composition, properties, applications and weights of stainless steels is included. . . 2

AUTOFEED PRESSES—Danly Machine Specialties, Inc., Chicago, III. Catalogue Series H describing the complete line of Danly Autofeed presses for high-speed production stamping with progressive dies. Capacities range from 50 to 800 tons, It explains how stampings can be turned out at a higher rate and how to get best efficiency out of progressive dies. Complete specifications are given.

OIL-TIGHT INDICATOR LIGHTS — Dialight Corporation, Brooklyn, N. Y. Catalogue Form L-200 describing a new compact series of indicator lights for heavy-duty industrial applications. Details are given on oil-tightness, dust-tightness, omnidirectional light spread, ruggedness and adaptability of these units. The exclusive Dialco feature—built-in resistors for neon lamps—is fully described. ...5

DOUBLE SEAMING MACHINES—E. W. Bliss Co., New York City. 12-page catalogue 36B describing Bliss semi-automatic round can seamers, square and irregular-shaped can seamers, automatic body feeds, semi-automatic square can seamers, and the Bliss semi-automatic side seamer. Design and construction features

VIBRATION MOUNTINGS—T. R. Finn & Co., Inc., Hawthorne, N. J. Catalogue SS-55 describing line of heavy-duty general-purpose steel spring vibration mountings. Included are construction details such as cast semi-steel housing containing helical steel springs, rubber thrust bumpers, nylon dampers, and steel baseplate with sway control assemblies. 10

CONTROLLED SPECIFICATION CAST IRON — McNally Pittsburg Foundries, Inc., Pittsburg, Kansas. Booklet entitled "Precision Cast Irons" containing specifications for six classes of metallurgically controlled irons. Both mechanical properties and tested applications are listed.

FIRST CLASS
Permit No. 53
(Sec. 34.9, P. L. & R.)
New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY-

MACHINERY 93 WORTH STREET NEW YORK 13, N. Y.

READERS' SERVICE DEPT.



POWDER METALLURGY—Keystone Carbon Co., St. Marys, Pa. 18-page bulletin on powder metallurgy giving a summary of the process, designing for powder metallurgy, and typical applications. Included are physical characteristics and chemical compositions of a number of ferrous and non-ferrous production materials. . . . 15

WALL STORAGE UNITS — Standard Pressed Steel Co., Jenkintown, Pa. Catalogue describing Hallowell storage units such as shelves, cases and drawers made of prime cold-rolled steel. These units are designed for use in tool-rooms to keep replacement parts and tools near the machine.

OPEN-BACK INCLINABLE PRESSES — Niagara Machine & Tool Works, Buffalo, N. Y. Bulletin 56, descriptive of the new Niagara Series E, single-point, open-back, inclinable presses with front-to-back crankshaft design. Specifications for the 75- to 200-ton line, available in both standard and automation models, are given. Also includes die space dimension drawings.

CLUTCH CONTROLS—Micro Switch Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. Catalogue 65 covering their new line of Micro Switch Trip Control and two-hand clutch controls of Industrial machines. Description includes control boxes, hand switches, foot switch, limit switches and lock-out switches.

POCKET GUIDE FOR USE OF TALIDE METAL — Metal Carbides Corporation, Youngstown, Ohio. Quick reference pocket guide on the correct use of Talide metal, presenting recommended grades, type of cut, and cutting speeds for machining various materials. A chart giving rake and relief angles for Talide metal-turning tools is also given. 20

RESIDUAL STRESSES IN COLD-FINISHED STEEL BARS—La Salle Steel Co., Hammond, Ind. Bulletin 16, entitled "ReCUTTING FLUIDS—Cincinnati Milling Products Division, Cincinnati Milling Machine Co., Cincinnati, Ohio. Circular PC-322, describing the principal features of "Cimplus," a concentrated chemical solution with exceptional rust control for grinding and machining operations and for use as a water conditioner.22

CHUCKS — Hardinge Brothers, Inc., Elmira, N. Y. Bulletin HS5, describing Hardinge-Sjogren speed collet chucks featuring rapid closing and opening of collet or step chuck by hand operation. New chucks are available for tool-room lathes, engine lathes, and grinders. . .27

SELECTION OF GRINDING WHEELS— Norton Co., Worcester, Mass. Booklet containing information on how to select wheels for the precision grinding of tool steels and constructional steels. Tables giving grinding wheel recommendations for different operations are included. 28

US MORE

INFORMATION.

BALL-BEARING SCREWS AND SPLINES
—Saginaw Steering Gear Division, General Motors Corporation, Saginaw, Mich.
32-page catalogue containing the latest information on machine-ground ball-bearing screws, rolled thread ball-bearing screws, and ball-bearing splines. 30

OPEN-BACK INCLINABLE PRESSES— E. W. Bliss Co., Canton, Ohio. Catalogue

Product Information Service

Use postage-free Business Reply Card below for further information on New Catalogues or New Shop Equipment described in this issue and products mentioned in the advertisements.

CITY	CO	COM	TITLE	NAME		Page	Page	Page	Puge	Page	Page				115			57	43	29	15	_	
-	ADD	COMPANY	:			:	:	:	:		:			14				US 00	1	30	16	м	
ZONE	CO. ADDRESS		:		7	:	:	:	:		:			145		103		59	45	31	17	64	
*		*			9829			:	:		:			146		104		60	46	32	10		
:	:		:		P	Advertiser	Advertiser	Advertiser	Advertiser	Advertiser	Advertiser	ADI	161	147			VIN	61	47	33	19	u	
:		9 0			nt y	riser	fisor	Ther	rilser	Ther	risor	ADVERTISED		= =		106	NEW SHOP	62	40	34	20	•	2
N	:		:	:	our	:	*	*	:	:		ISED	163	149	121	107	QP	63	49	35	21	7	TAL
ONE			:	:	mor		:		:		:			150		108	100	2	50	36	22	00	CATALOGUES
:	:	:			gn	:	:		:		:	PRODUCTS		151	123	109	EQUIPMENT	65	51	37	23	9	ES
				:	d ad							SES		152		10	S	66	52	38	24	10	
STATE		:			Please print your name and address			* * * 0		:	:			153	125	=		67	Un Ga	39	25	-	
	*		* *											54	126	112		6	54	40	26	12	
:	*	:	* *					:	:					155		113		69	55	4	27	13	
:	:						:				:		170	156	128	14		70	56	4	28	-	

2D, containing 32 pages of information covering the Bliss complete line of inclinable presses ranging from 10 to 200 tons. A special section covers clutches, automatic feeds, and die cushions. . . 31

WHEELABRATOR BLAST - CLEANING EQUIPMENT — Wheelabrator Corporation, Mishawaka, Ind. Catalogue 724, describing the application of specially designed airless blast equipment to fifty-six production cleaning problems, such as encountered with cast, welded, forged, heat-treated, and machined components.

COLD-DRAWN STEEL SPECIAL SECTIONS — Republic Steel Corporation, Union Drawn Steel Division, Massillon, Ohio. Booklet describing the advantages obtainable with cold-drawn special sections, including reduced machining, greater strength, high surface finish, accuracy, and flexibility of design. 33

HIGH-FREQUENCY INDUCTION HEAT-ING — Magnethermic Corporation, Youngstown, Ohio. Bulletin describing high-frequency induction heating of heat-treating, joining and hot forming, heating stations, output transformers, motorgenerator sets, and generator control units.

MULTIPLE-SPINDLE DRILL-TAPPER—Cleveland Tapping Machine Co., Canton, Ohio. Circular descriptive of the Cleveland Junior multi-spindle drill-tapper, a machine of flexible, universal design, capable of drilling up to eight No. 25 holes and tapping up to eight 10-32 holes.

DIAMOND TOOLS—Diamond Tool Co., Inc., Milford, N. H. 6-page bulletin describing method of mounting diamonds permitting use of stones two-thirds smaller than previously used. Result of "fusing" diamond to tool shank is described.

ELECTRIC BRAKES AND CLUTCHES—Warner Electric Brake & Clutch Co., Beloit, Wis. Application analysis report (Form WEB6194), describing twenty-one of the many ways in which standard Warner electric brake units can be applied to power transmission drives. . . . 43

CONTROL TRANSFORMERS — General Electric Co., Schenectady, N. Y. 32-page catalogue GED-2767, describing the complete line of G. E. control transformers, including auto-transformers, ma-

GRINDING WHEELS—Peninsular Grinding Wheel Division of Abrasive and Metal Products Co., Detroit, Mich. Catalogue 5E, giving sizes and specifications, as well as general information on the Peninsular line of grinding wheels.

PROVING RINGS FOR MATERIALS-TESTING MACHINES—Morehouse Machine Co., York, Pa. Bulletin 116, describing the working principles of both compression type and tension type proving rings for calibrating materials-testing machines. 47

CUTTING OIL—Sun Oil Co., Philadelphia, Pa. Bulletin 39, describing "Sunicut" 5534, a transparent, non-

FIRST CLASS
Permit No. 53
(Sec. 34.9, P. L. & R.)
New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY-

MACHINERY

93 WORTH STREET NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

FIRST CLASS

Permit No. 53
(Sec. 34.9, P. L. & R.)

New York, N. Y.

BUSINESS REPLY CARD

No Postage Stamp Necessary if Mailed in the United States

POSTAGE WILL BE PAID BY-

MACHINERY

93 WORTH STREET NEW YORK 13, N. Y.

READERS' SERVICE DEPT.



emulsifying cutting oil for use on a wide variety of steels, especially suitable where frequent changes of stock and operation are encountered. ..

JIG BORERS—Pratt & Whitney Co., Inc., West Hartford, Conn. Circular 587, de-scribing the outstanding advantages and illustrating various applications of Pratt & Whitney Electrolimit jig borers, des-signed for a wide range of work sizes. 50

CLEANING FILTERS—Cuno Engineering Corporation, Meriden, Conn. Catalogue SAK-057, covering the new "Super Auto-Klean" continuously cleanable filter

VERTICAL MILLING MACHINE—Tree
Tool & Die Works, Racine, Wis. Catalogue A55 describing the 2UV vertical
milling machine. Details of automatic
collet closer, roller spindle drive, and tur-

MULTIPLE-WAY MACHINE TOOLS-W. F. & John Barnes Co., Rockford, III.

address

Catalogue TR on automatic multiple-way machine tools, giving tooling drawings, operation data, and estimated performance for specific work-pieces. 53

SPRAYED-METAL COATINGS -- Metallizing Engineering Co., Inc., Westbury, N. Y. Bulletin 120, illustrating and de-scribing a wide range of metallizing applications in the production of electrical and electronic equipment,

PRECISION BORING MACHINES-Cell-O Corporation, Detroit, Mich. Bulle-tin 31154, illustrating and describing the Bor-Dril method of finish-machining holes from the solid. Typical examples of operations are shown. 55

ROTARY SURFACE GRINDER—Arter Grinding Machine Co., Worcester, Mass. Circular illustrating and describing the Arter Model F rotary surface grinde equipped with 12-inch chuck. 56

GRAPHIC ENGINEERING — Robert B. Warman, Inc., Buffalo, N. Y. Booklet entitled "A Voice for Technology," de-

EQUIPME 108 109 122 123 136 137 150 151 164 165

NT 110 1124 1152 1152

126

27

you wish furth

Circle r infor

scribing the company's research, writing, photographic and technological art services. Above services are available for the preparation of technical literature, handbooks, inspection and quality control manuals, engineering reports, and others.

DIE-CASTING DIES AND MOLDS FOR PLASTICS—Parker Stamp Works, Inc., Hartford, Conn. Folder 855, illustrating Parker die-casting dies and giving typical case histories of molds for plastics.

INDUCTION HEATING—Westinghouse Electric Corporation, Pittsburgh, Pa. Bulletin 85-843, explaining the induction heat-treating of shafts, axles, pinions, gears, and similar parts. . . .

WORK-HOLDING FIXTURES—Universal Vise & Tool Co., Parma, Mich. Catalogue 9155, describing the entire line of universal vises and work-holding fixtures made by this company.

TOOL-ROOM LATHES—Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Circular illustrating and giving complete specifica-tions of the new Cincinnati light-duty tray-top tool-room lathe. ...

PRECISION HOLE GRINDERS-Prott & Whitney Co., Inc., West Hartford, Conn. Circular 589, descriptive of the Pratt & Whitney No. 2E vertical, precision hole

BEARING LUBRICATING GREASE—Sun Oil Co., Philadelphia, Pa. Technical Bul-letin 40, describing Sun 844X grease which can be used at temperatures up to 250 degrees F.

SOLVENT RECOVERY—Carbide Carbon Chemica's Co., New York City. 36-page booklet (F-4410D) on the Columbia activated-carbon system of solvent recovery.

AUTOMATIC SCREW FEEDING SYSTEM —Pneuma-Serve, Inc., Cleveland, Ohio. Circulars describing the Pneuma-Serve automatic system of screw feeding. . . 65

DOUBLE-ACTION PRESSES—Danly Machine Specialties, Inc., Chicago, III. Circular D/2, covering the Series D line of Danly double-action, straight-side presses. Includes complete specifications. 66

HYDRAULIC METALWORKING PRESSES —Elmes Engineering Division, American Steel Foundries, Cincinnati, Ohio. 24-page Bulletin No. 1010-C describing complete line of Elmes hydraulic metal-and hobbing.

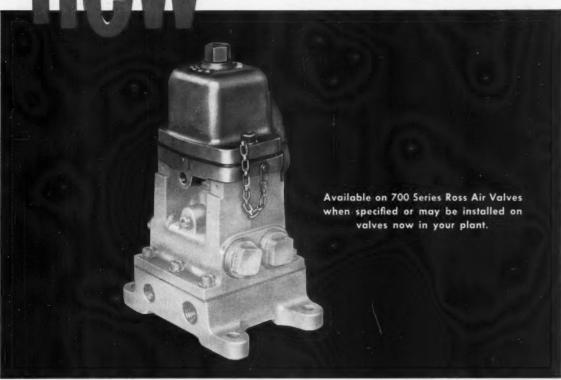
WORM GEARS—Cone-Drive Gears Division, Michigan Tool Co., Detroit, Mich. Bulletin CA-55 giving complete engineering details on the assembly procedure for Cone-Drive double-enveloping worm gear-

PRECISION DOUBLE-SPINDLE GRINDER —Gardner Machine Co., Beloit, Wis. 16-page catalogue illustrating and describ-ing Gardner 2H30 precision horizontal double-spindle disc grinder.

PRESSURE TUBING AND PIPE-Babcock & Wilcox Co., Beaver Falls, Pa. Bulletin TB-357 giving information on tubular products intended for sub-zero tempera-

PLEASE SEND	S O	S MORE		you wish further information.	ish	101	4	infor	nation.	on.	item n	חחו	mbers	item numbers on	which you	ch you
		_	CATALOGUES	LOGU	ES										0	CATALC
1 2 3		Ut	0			10	=	12	13	ī.	-	140	u		UR -	201
15 16 17	-					24	25	26		28	15	16		18		0 21
			14 35	36	37	38	39			42	29	30	4		33 34	
44			48 49			52	S		55	56	43	1			47 48	8 49
57 58 59	60	61 62	2 63	64	65	66	67	83	69	70	57	58	59	60 6	61 62	63
	_	NEW SHOP EQUIPMENT	SHOP	EQL	IPM	H								z	NEW SHOP	O
101 102 103 104 105 106 107 108 109 110	104	05 10	6 102	108	109		=======================================	112 1	113 1	114	101	102	103 104		105 106 107	10
	118	119 120 121	0 121	122	122 123 124		125	126 1	127 1	128		116	117 1	118 11	119 120	121
130 131	132	132 133 134 135	14 13		137 138		139	140 1	141 1	142		130	131 1	132 13	133 134	1 135
144 145	146	146 147 148 149	10 14	9 150	151		153	154 1	155 1	156	143	144 145		146 14	147 148	149
157 158 159 160 161 162 163	160	61 16	2 16		164 165 166	166	167	108	169 1	170	157	158	159 1	01 00	160 161 162 163	21.2
		AUVERTISED PRODUCTS	KIISEIIX	D PK	0000	-								>	VACKLISED	19
Page		Advertiser				:	:			:	Page	:	:	. Ad	Page Advertiser	4
Page	A	Advertiser			:		:	:		:	Page	:	:	. Ad	Advertiser	-
Page		Advertiser			:		:			:	Page	:	:	. Ad	Advertiser	
Page Advertiser		dverth		**********************************	:	:			:	:	Page	:	:	. Ad	Advertiser	
Page	: A	Advertiser	107		:	:	:			:	Page	:	:	. Ad	Advertiser	-
Page		Advertiser	107		:	:	:		*	:	Page	*	:	Ad	Advertiser	4
Pi	9	Please print your name and address	your	nam	e and	ode	ress			_			Ple	use p	Please print your n	100
NAME			:		:	:			0	: 	NAME		:	:		:
	:					:	*			:	TITLE		:	:		:
COMPANY .	:	8								-	COM	PAN	:		COMPANY	
CO. ADDRESS	*									-	co.	ADDE	ESS	:	CO. ADDRESS	:
CITY ZONE STATE		:	:	MOZ		:	IVIS			:	CITY	*		:	CITY Z	*
This courd is wold ofter April 1, 1056	bio	after	April	1, 1	956			N	M-1/56	56	This	card	This card is void after April 1	oid a	707	P

JIC Solenoid and Cover



- Cover protects solenoid against dust, splashing liquids and airborne contaminations.
- Can be manually operated without removing cover.
- Ample wiring connection space.
- * Ring type pressure connectors.
- Interchangeable with standard Ross cover and solenoid.

- Valve becomes electrically inoperative when cover is removed.
- Captive type cover fasteners.
- Chain to prevent loss of cover.
- Threaded electrical conduit connection.
- Provision for piped exhaust.
- JIC Solenoid Cover and Head Assembly also available for 700 Series Momentary Valves.

Tomorrow's EnginAlRing Delivered Today...Anywhere



Ross

OPERATING VALVE COMPANY

110 E. GOLDEN GATE AVENUE . DETROIT 3 . MICHIGAN

Mews of the industry

California, Texas and Oklahoma

ACME TOOL & SUPPLY Co., San Diego, Calif., has been made sales representative for the TAFT-PEIRCE MFG. Co., Woonsocket, R. I., to handle the Taft-Peirce standard line of fixed gages, air gages, small tools, and magnetic chucks in the San Diego area.

JOSEPH HORACEK, Jr., has been appointed assistant sales manager of the Turco Products, Inc., Los Angeles, Calif. In addition to over-all sales, Mr. Horacek will specialize in sales personnel, sales training, and new product development.

SAGINAW STEERING GEAR DIVISION OF GENERAL MOTORS CORPORATION, Saginaw, Mich., has opened a new West Coast office at 13542 Ventura Blvd., Sherman Oaks, Calif., with MAURICE K. HORAN in charge as sales engineer.

ROBERT DILLING has been appointed sales engineer of the E. W. Bliss Co., Die Supply Division at the Southern California Sales and Service Office.

F. A. W. Anger has been appointed director of manufacturing of Axelson Mfg. Co., Division of U. S. Industries, Inc., Los Angeles, Calif. Mr. Anger will be responsible for all manufacturing of petroleum equipment, machine tools, and aircraft products at the Montebello and Vernon plants.

W. O. W. SMITH, JR. has joined the Rockford Clutch Division of the Borg-Warner Corporation, Houston, Tex., as sales engineer and direct factory representative in the western oil fields. He was formerly associated with the Buda Engineering & Equipment Co. and the Waukesha Sales & Service Co., both of Houston.

CONOFLOW CORPORATION, Philadelphia, Pa., announces the appointment of the ERNIE GRAVES Co., Tulsa, Okla., as sales representative for their Cono controls in the Oklahoma territory.

Illinois and Wisconsin

WHEELCO INSTRUMENTS DIVISION, BARBER-COLMAN Co., Rockford, Ill., announces that the Seattle area is now being served by their branch office located at 9590 N. E. 24th St., Bellevue, Wash. Also announced is the appointment of the Grant Edgel Co., 8714 N. E. Siskiyou St., Portland, Ore., which will be a representative for Wheelco industrial instruments in the Portland area.

EKSTROM, CARLSON & Co., Rockford, Ill., announces the following appointments: RAY C. REINHARTSEN, formerly vice-president and general manager of Onsrud Machine Works, Inc., has been named general sales manager. FRED J. HEID has been appointed exclusive representative to the aircraft industries in the eastern half of the United States.

G. R. GORDON was appointed exclusive representative to the aircraft industries in the western half of the United States.

JOSEPH T. RYERSON & SON, INC., Chicago, Ill., announces the following expansions: Construction of an addition to its Buffalo plant which will increase by almost 50,000 square feet the former plant and office space. Purchase of an eleven and one-half acre site in Mecklenburg County, near Charlotte, N. C., for a new steel service plant to be erected in the near future. Steel warehousing subsidiary of Inland Steel Co. announces the purchase of the Wallingford, Conn., plant of the Follansbee Metals Corporation with a warehouse area of more than 47,000 square feet.

CHARLES T. SCHWARZ has been made Chicago branch sales manager for the Yale & Towne Mfg. Co., Philadelphia, Pa., manufacturer of industrial lift-trucks and hoists. He replaces Roy L. Wolter, who was recently appointed general manager of the Yale & Towne Automatic Transportation Co. Division in Chicago. In his new position, Mr. Wolter succeeds John A. Baldinger, who is now general manager of the Materials Handling Division, the post previously held by Elmer F. Twyman, a vice-president.

ILLINOIS TOOL WORKS, Chicago, Ill., announces that the Detroit sales office of the company and its Shakeproof Division, producer of fastening devices, have moved from 2895 E. Grand Blvd. to new and larger quarters at 1403 E. State Fair.

TWIN DISC CLUTCH Co., Racine, Wis., has announced the reorganization of its field sales by appointing Industry Managers, who will concentrate on various branches of the industry. George Bastian has been named industry manager—Metalworking Accounts, servicing Twin Disc clutches and machine tools, and other metal-working machinery. Other industry managers are: George W. Upp—Crane and Shovel Accounts; P. G. Tyrrell—Rubber Tired Vehicles Accounts; and R. C. McRoberts—Engine Accounts.

W. F. SHURTS has been elected vice-president of engineering for the Twin Disc Clutch Co., Racine, Wis. Since 1951 he has been director of engineering.



F. A. W. Anger, director—manufacturing, Axelson Mfg. Co.



Ray C. Reinhartsen, general sales manager of Ekstrom, Carlson & Co.



WHEN the problem is a rush hollow parts job, phone or wire the Timken Company and we'll ship less-than-mill quantities of 52100 tubing within 24 hours after receiving your order.

Timken® 52100 steel tubing is excellent for most of your high quality hollow parts jobs. It's a through-hardening steel in moderate sections. It can be heat treated to file hardness and tempered back to any desired point. And it can frequently be used in place of more expensive steels.

Available in sizes from 1" to 10½" O.D., Timken 52100 steel is used for hollow parts such as: aircraft parts, ball bearing races, pump parts and plungers, collets, bushings, spindles, grinding machine parts, precision instruments, and dozens of others.

The Timken Company is Ameri-

ca's pioneer producer of 52100 tubing. And we're the only company that makes 52100 steel in tubing, bars and wire. Our unequalled experience assures you of uniform quality from tube to tube and heat to heat.

For immediate delivery of your less-than-mill quantity orders, write, wire or phone The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMBEN PIN Alloy STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



Andrew K. Wilson, vice-president, Kearney & Trecker Corporation

Kearney & Trecker Corporation, Milwaukee, Wis., announces the appointment of Andrew K. Wilson to the newly created position of vice-president, industrial relations. Mr. Wilson served as director of industrial relations since 1951 and has been with the company for the past twenty years. Morris L. Hutchens was appointed chief engineer. He fills the post vacated by Orrin W. Barker, who was recently named vice-president in charge of engineering.

Warren C. Olson has been elected executive vice-president of the Besly-Welles Corporation, Beloit, Wis., manufacturer of large production disc grinders, abrasives, and machinists' cutting tools. At the same meeting, E. Kenneth Welles, Jr. was named secretary of the company, filling the vacancy left by Mr. Olson's promotion. Mr. Welles will continue to act as advertising and sales promotion manager of the firm, in addition to filling his new duties.

New England

VAN NORMAN INDUSTRIES, INC.—formerly Van Norman Co.—Springfield, Mass., announces the following appointments in their Morse Twist Drill & Machine Co. affiliate: Charles F. Myers, president; J. J. Haves, executive vice-president and general manager; and James Y. Scott, chairman of the board. Operating under Van Norman Industries, Inc., will be the Van Norman Machine Co. of Springfield, with Charles R. Crowder as president; the Van Norman Automotive Equipment Co., Springfield, with Selby Greer as president; the Morse Twist Drill & Machine Co. New Bedford, with Mr. Myers as president; Super Tool Co., Detroit,



Charles F. Myers, president, Morse Twist Drill & Machine Co.

with Gordon Birgbauer as president; and the Insuline Corporation, Manchester, N. H., with S. J. Spector as president. Announced is also the acquisition of Transitron, Inc., manufacturer of electronic components and assemblies. This company at present operates two plants in New York City, but it is planned to move the new subsidiary to Manchester, N. H. Approximately 100,000 square feet of floor space will be available at the new location.

PRATT & WHITNEY Co., INC., West Hartford, Conn., announces the following appointments: DAVID R. ANDERSON, vice-president-controller and GEORGE F. McDonough, vice-president—industrial relations. Mr. Anderson has been controller of the company since 1952 and Mr. Mc-

Donough has been manager of industrial relations since 1945.

FARREL-BIRMINGHAM Co., INC., Ansonia, Conn., has purchased the Press Division of the Watson-Stillman Co. Division of H. K. Porter Co., Inc., Roselle, N. J.

GEORGE W. HERMAN was appointed assistant plant manager of the American Chain & Cable Co., Inc., Bridgeport, Conn.

TAFT-PEIRCE MFG. Co., Woonsocket, R. I., announces the appointment of RUSSELL W. GRABINSKY as assistant superintendent of the Small Tool and Gage Division. Mr. Grabinsky was previously production foreman in this division of the company, as well as in the Contract Service Division.

New York

SENECA FALLS MACHINE Co., Seneca Falls, N. Y., manufacturer of Lo-Swing lathes and special automation equipment, has appointed the following representatives: PRODUCTION MACHINERY DISTRIBUTORS, Upper Darby, Pa., in the Philadelphia, Maryland, and Delaware areas; L. W. HODSON MACHINERY Co., Cincinnati, Ohio, in the Dayton-Cincinnati area; and GEOFFROY-LANE, INC., in the Colorado, Utah, and New Mexico territory.

RICHARD F. TRIMBACH was appointed manager, New Products Development, of Loewy Construction Co., Division of Baldwin-Lima-Hamilton Corporation, New York City. Mr. Trimbach was formerly executive assistant to the director of customer relations of Northrop Aircraft Co., Anaheim, Calif.

(This section continued on page 230)





(Left) David R. Anderson, vice-president-controller; (right) George F. McDonough, vice-president—industrial relations, Pratt & Whitney Co., Inc.

HEAVY EXTRUDED SHAPE

Saves 25 per lb

FOR THE STRONG ELECTRIC CORP.

The unusual thing about this copper extruded shape is that it saves money in first cost as well as in machining time. The double economy amounts to over 25¢ per pound. The large illustration shows the shape as supplied in the form of a slug or pre-formed disc, 13½ x 5". This begins as a long extrusion, from which Revere cuts the discs, and pickles them before shipping.

The customer is The Strong Electric Corp., Toledo 2, Ohio, which originally tried plate and bar, but found costs were too high. Revere Product Engineers, Methods and Production Departments collaborated with the company on the problem, and were able to develop the unusually heavy and economical shape. Strong reports a number of savings. One is that the shape is machined quickly and perfectly, with almost no rejects. This is due to the denseness and uniformity of the metal, a result of the high pressures exerted during extrusion. (Finishing operations include drilling bolt holes and cutting cooling fins.) As a secondary result of improved machining, the customer does not have to keep large inventories of metal to take care of spoilage, nor handle large quantities of scrap. Further, Revere supplies the discs in the correct thickness, eliminating a cutting-off operation for Strong. Incidentally, we are glad to supply shapes cut to dimensions, or in long lengths, as desired.

The completed part is an obturator-probe, which fulfills a control and heat dissipation function in a powerful searchlight. Copper was chosen for its ability to conduct heat and resist corrosion. Revere will be glad to collaborate with you in your search for economies through the use of extruded shapes in copper and copperbase alloys, and aluminum alloys.

Copper Extruded Shape, 1\%" x 5", as furnished.

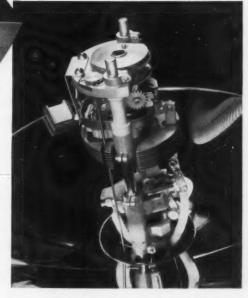
Shape in place in a carbon arc searchlight mechanism.



COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801 230 Park Avenue, New York 17, N. Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.



For more information fill in page number on Inquiry Card, on page 221







(Left) George E. Munschauer, chairman of the board, (center) Fred E. Munschauer, Jr., president and general manager; and (right) Franklin A. Reed, vice-president in charge of sales, of Niagara Machine & Tool Works

NIAGARA MACHINE & TOOL WORKS, Buffalo, N. Y., announces the following appointments: GEORGE E. MUN-SCHAUER, chairman of the board and chief executive officer. He has been with the company since 1928 and served as treasurer and director since 1941 and vice-president and treasurer since 1945. FREDERICK E. MUNSCHAUER, JR., president and general manager. He was formerly vice-president in charge of manufacturing and industrial relations. FRANKLIN A. REED, vice-president in charge of sales, was formerly sales manager and a director since 1945. EDWIN A. MUNSCHAUER, JR., treasurer and director. He joined the company in 1936 and worked as a service manager since 1941.

GEORGE R. MILNE has been appointed president of the NATIONAL CARBIDE Co., a division of Air Re-

George R. Milne, president of the National Carbide Co.

duction Co., Inc. He succeeds J. Carl Bode, who died recently. Mr. Milne's headquarters will be at 60 E. 42nd St., New York City.

EUGENE P. HAWKINS has been elected vice-president of Revere Copper & Brass, Inc., New York City, succeeding HAROLD N. TODT. He has also become executive head of the company's Michigan division. Mr. Hawkins was previously assistant general manager of that division.

PHILLIPS SCREW Co., New York City, announces the following elections of officers of FASTENERS INC., its wholly owned subsidiary: C. M. CAMBERN, formerly president, was elected chairman of the board. JUDSON B. SHAFER, executive vice-president, was elected president and general manager.

JACK WILLIAMS has been appointed sales engineer in the Rochester, N. Y., district for the line of drilling machines made by the Leland-Gifford Co., Worcester, Mass. He succeeds ARTHUR H. ANDERSON.

Ohio, Michigan, and Indiana

LINCOLN ELECTRIC Co., Cleveland, Ohio, announces the opening of a new branch office and warehouse at 1224 Walnut St., Denver, Colo. The district manager for the Denver area will be MERRILL F. YALE, who has been a sales engineer in the San Francisco office since 1949. The JOHNSON SUPPLY Co. will also continue to sell Lincoln products. Another new appointment is that of RAY ZEH as Chicago district manager. He has been transferred to his new position from the Syracuse office, of which he has been district manager for the last four years.

TIMKEN ROLLER BEARING Co., Canton, Ohio, announces an expansion program of \$5,000,000 at the Columbus plant of the company. This comprises the installation of a new production unit designed to increase the output of bearings, in order to meet the rapidly growing demands of the railroad industry. Screw machines, heat-treating equipment, and roller headers will be installed. The new unit, which is expected to be completed by January 1, 1957, will have an annual capacity of 160,000 bearings.

OSTER MFG. Co., manufacturer of pipe and bolt threading machinery and material-handling equipment, has recently moved into a new plant on E. 289th St. in Wickliffe, Ohio. The new quarters have a total area of 105,000 square feet, and represent an expansion of the company's previous plant at Wickliffe, which has been operated as an adjunct to the main Cleveland plant.

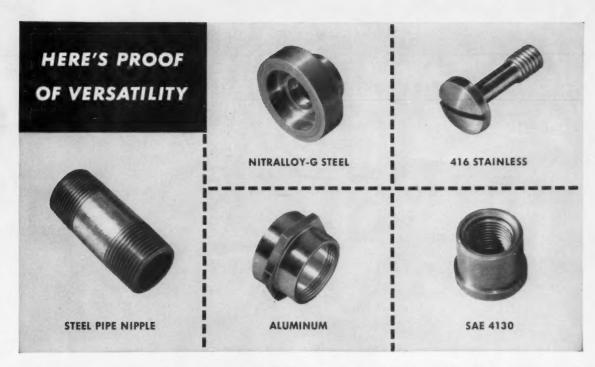
OHIO KNIFE Co., Cincinnati, Ohio, has appointed H. J. MARTY district manager of the New York office to take the place of ROBERT DOUGLAS, who is retiring from active service but will retain his position as secretary of the company.

WILLIAM A. GENT has been made field engineer for the Cleveland sales office of the Warner & Swasey Co. Mr. Gent has been connected with the company since 1953.

ROBERT H. ETNYRE has been appointed plant manager of the Toledo plant of the National Supply Co. He succeeds ROBERT E. VALK, who resigned.

SNYDER TOOL & ENGINEERING Co., Detroit, Mich., manufacturer of automated special machine tools and packaging machinery, has an-

(Continued on page 234)



SUN DEVELOPS VERSATILE NEW CUTTING OIL FOR SCREW MACHINES AND JOB SHOPS

New cutting oil, Sunicut 5534, is moderately priced...gives excellent machining results on wide range of steels

New Sunicut 5534 is a non-emulsifying, transparent cutting oil specially compounded to give above-average machining results to operators who want a single oil to machine a large variety of ferrous metals,

Tests have proved that new Sunicut 5534 meets this demand for an all-purpose cutting oil. It is ideal for general screw machine and turret lathe work. It is also excellent for tapping, drilling, threading, and light stamping operations. In addition, new Sunicut 5534 can be used on many special machining jobs, both high and low speed, with metals ranging from B1112 to 4130 as well as free-machining stainless steels.

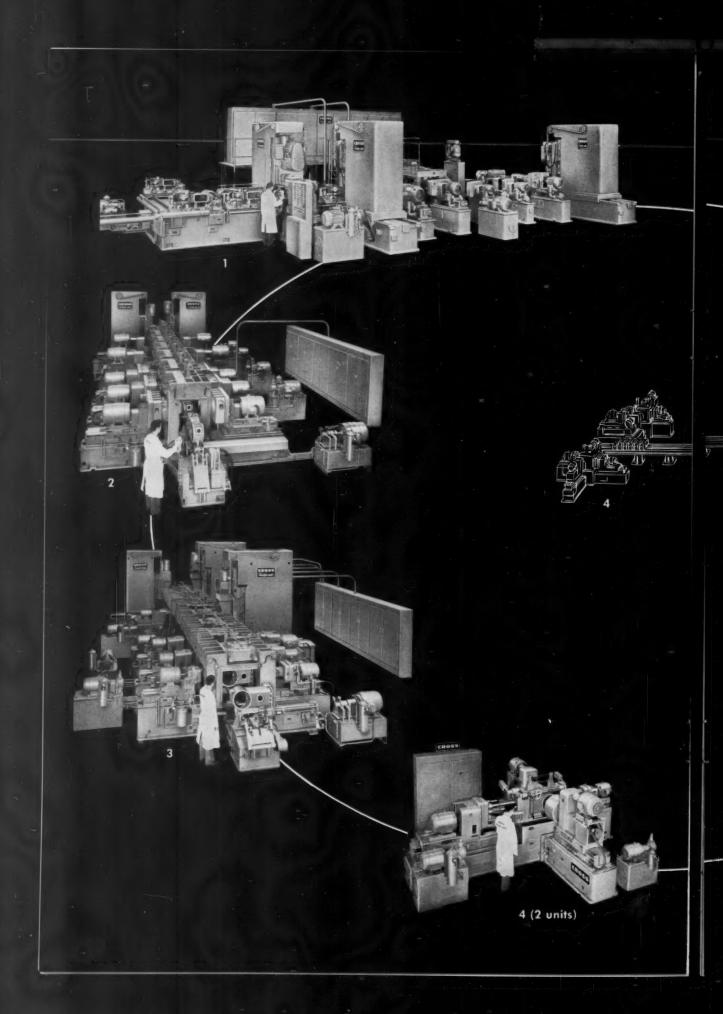
For complete information about new Sunicut 5534 and how it can help you reduce your oil inventories...lower your production costs...see your Sun representative. Or write Sun Oil Company, Phila. 3, Pa., Dept. M-1.



INDUSTRIAL PRODUCTS DEPARTMENT

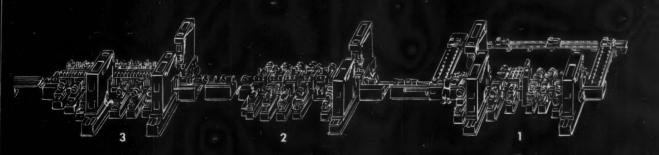
SUN OIL COMPANY, PHILADELPHIA 3, PA.

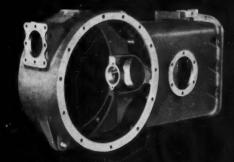
IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL



More Sectionized Automation by Cross

Tractor
Differential Housings
from Rough Castings
to Assembly!







- * 46 pieces per hour at 100% efficiency.
- ★ 225 foot Sectionized (segmented) Transfer-matic of 4 sections.
- ★ 313 operations: 19 milling, 7 cross-facing, 110 drilling, 17 boring, 72 chamfering, 4 spot-facing, 8 reaming and 76 tapping.
- All parts in Cross machines—even tooling details—are made to interchangeable tolerances for fast, easy maintenance.
- Other features: Construction to JIC standards; hardened and ground ways; automatic lubrication; hydraulic feed and rapid traverse except tapping; individual lead screw for tapping.

Established 1898

THE CROSS

First in Automation

nounced the purchase of an 18,000 square foot, story-and-a-half, brick building for use as a warehouse. The new facilities were required to speed up the building of the huge new automated special machine tools made by the company. It is also stated that the company is in the process of completing a \$500,000 addition to its main plant on Lafayette Ave.

JOHN C. TERRY, JR., has joined the Machine Products Corporation, Detroit, Mich., as chief engineer, with special responsibilities for developing inspection techniques for use with the "Rotab" universal checking table. Prior to his present association, Mr. Terry was gage engineering supervisor for the Allison Engine Division of General Motors Corporation.

Ex-Cell-O Corporation, Detroit, Mich., has purchased a plant having 66,000 square feet of floor space at Elwood, Ind. (between Fort Wayne and Indianapolis), as well as a fifteen-acre plant site at Downey, Calif. Plans are being made for the erection of a 60,000 square foot manufacturing building on the new California site.

C. H. WILLS, formerly vice-president in charge of sales of the Michigan Abrasive Co., Detroit, Mich., has been appointed to a newly created vice-presidency. W. S. Hoskin becomes general sales manager.

CLARK EQUIPMENT Co., Benton Harbor, Mich., is planning to expand its new Construction Machinery Division plant by the addition of a 125,000 square foot wing, which will increase the size 50 per cent.

Mr. Fred S. Haas has been named director of product engineering of the National Automatic Tool Co., Richmond, Ind. Mr. Haas was formerly with the Cincinnati Milling Machine Co. of Cincinnati, Ohio.

Pennsylvania and Maryland

KENNAMETAL, INC., Latrobe, Pa., announces the acquisition of the T. R. ALMOND MFG. Co., Willoughby, Ohio, manufacturer of drill chucks. It is stated that the firm was acquired primarily to provide additional facilities for the manufacture of the company's Kendex, Kennamatic and other mechanically held types of metal-cutting tools. Mark A. Rollinson, a member of the Kennametal Detroit sales organization, will be manager of the new plant.

JOHNSON BRONZE Co., New Castle, Pa., manufacturer of sleeve bearings, announces the appointment of B. A. JARED as sales representative in the Cincinnati area. Mr. Jared, formerly of the purchasing department of the Warner Gear Corporation, Muncie, Ind., will take over the duties previously handled by JOHN STONE. Mr. Stone has been transferred to the sales department of the home office.

SKF INDUSTRIES, INC., Philadelphia, Pa., announces that RICHARD H. DEMOTT, previously chairman of the board and president of the company, has relinquished the post of president but continues to serve as board chairman. EDWIN R. BRODEN, executive vice-president, succeeds Mr. DeMott as president and chief executive officer. Mr. Broden has also been elected a director.

CHARLES E. RICE was elected executive vice-president of the Jessop Steel Co., Washington, Pa., at a recent meeting of the board of directors. For the last five years, Mr. Rice has been vice-president in charge of sales, and will continue to concentrate on sales in his new position, as well as assuming some administrative responsibilities.

WESTINGHOUSE ELECTRIC CORPORA-TION, Pittsburgh, Pa., has recently opened a metals pilot plant designed to bridge the gap between laboratory and commercial production of new alloys and processes at Blairsville, Pa. The \$6,000,000 facility, a plant of 173,000 square feet, combines under one roof virtually all types of metal processing equipment.

CRUCIBLE STEEL Co. OF AMERICA, Pittsburgh, Pa., at a recent meeting of the board of directors, elected JAMES D. GLENN vice-president of sales, and MAURICE J. DAY vice-president of research and development. Mr. Glenn was formerly general manager of sales, and Dr. Day

has been serving as director of research and development. At the same meeting, WILLIAM H. REA was elected a director to fill the unexpired term of the late M. Crouse Klock, of Syracuse, N. Y. Don P. Carr has been made assistant to the manager of the Tool Steel Sales Division of the company. Mr. Carr will be responsible for tool steel sales in the West Coast Sales Division, and will maintain offices in Los Angeles, Calif.

THE LANDIS MACHINE Co., Waynesboro, Pa., is planning to build an addition to its present Tap Division Building. In it will be housed the Research Department and the newly created Thread Roll Die Department, together with office facilities for these departments.

PINES ENGINEERING Co., Aurora, Ill., manufacturer of tube fabricating machinery and equipment, has appointed the McBeth Machinery Co., 1109 Grant Bldg., Pittsburgh, Pa., distributor for the company in the Pittsburgh and Philadelphia areas.

HENRY DISSTON & SONS, INC., Philadelphia, Pa., manufacturer of saws, files, steel specialties and allied products, has been acquired by the H. K. PORTER CO., INC., Pittsburgh, Pa. LAWRENCE L. GARBER, a vice-president of the Porter company, will serve as general manager.

CHANDLER BOYD Co., Pittsburgh, Pa., announces the following appointments: ROBERT MCC. MAXWELL, executive vice-president; HAMES L. PERROTT, sales manager.

JOHN ROBERT DIAMOND has been named to the newly created position of personnel manager of Rockwell Mfg. Co., Pittsburgh, Pa.

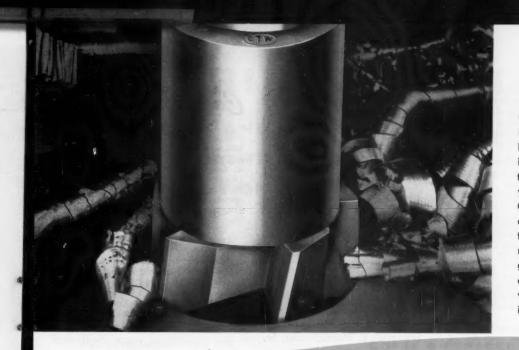


James D. Glenn, newly-elected vicepresident of sales of the Crucible Steel Co. of America



Fabian Bachrach

Maurice J. Day, vice-president of research and development, Crucible Steel Co. of America



Counterboring a hole in a steel workpiece. Notice the chip uniformity. Here is evidence of the free-cutting action you get with Continental Counterbores. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive. Notice, too, the wide cutter flutes aiding in chip disposal.

CTW

How to get smooth cutting and ruggedness with large diameter COUNTERBORES

and quick, twist-of-the-wrist disengagement, too

And even after the toughest cuts the Continental Cutter disengages from the holder with a quick twist of the wrist. Because of the shape of the driving members, wedging or jamming cannot occur to delay the interchanging of cutters.

Continental Counterbore Sets are available in your choice of sizes. Each is fully described in Bulletin 60446. Write for your copy today. Machine operators know that the real test of a counterbore drive is how it stands up under the stresses imposed during large diameter cutting operations. And operations like these have been the proving ground for Continental Counterbores. In customers' plants Continental Drives and Cutters, regardless of size have demonstrated their extreme ruggedness. An added feature to save minutes: Each Continental Counterbore Holder accommodates a wide range of cutter sizes.

Vontinental

TOOL WORKS
Division of Ex-Cell-O Corporation
Detroit 32, Michigan

LEBANON STEEL FOUNDRY, Lebanon, Pa., has named DAVID C. EKEY director of research for the company. Dr. Ekey will direct a vastly expanded program of research into new casting techniques and procedures.

STANDARD PRESSED STEEL Co., Jenkintown, Pa., and CLEVELAND CAP SCREW Co., Cleveland, Ohio, combined their companies into one organization.

NEIL HELLER & Co., Baltimore, Md., has recently been formed to represent manufacturers of machine tools and other types of machinery. Among the companies represented are the BUFFALO FORGE CO., CINCINNATI ELECTRICAL TOOL CO., GREAVES MACHINE TOOL CO., HANCHETT MFG. CO., OLIVER INSTRUMENT CORPORATION, PORTAGE MACHINE CO., K. R. WILSON, INC., and U. S.-BURKE MACHINE TOOL DIVISION.

Obituaries

George Gorton, Sr.

George Gorton, Sr., president of Gorton Machine Co., died on November 22, at the age of ninety years, He was a pioneer machine tool builder who saw his original machine shop, which he started sixtyseven years ago, grow into an internationally known concern as makers of precision machine tools. Although Mr. Gorton had no formal engineering training, he invented and produced explosion-proof stoves, and perfected and built two machines that became standard equipment. A national tool magazine, published in 1901, listed him as one of the "twenty best brains in the machine tool field."



Frederick E. Munschauer, Sr.

FREDERICK E. MUNSCHAUER, SR., president and general manager of the Niagara Machine & Tool Works, Buffalo, N. Y., died on October 22 at the age of seventy years. Mr. Munschauer was the father of Frederick E. Munschauer, Jr., vice-president in charge of manufacturing and industrial relations. He had been active in the machine tool industry for nearly half a century and was responsible for many developments and improvements in mechanical presses, shears, and other sheet-metal fabricating machines.

J. CARL BODE, president of National Carbide Co., Division of Air Reduction Co., Inc., New York City, died November 11, 1955 at the age of 53. He joined the company in 1928 and held various posts. In 1948 he was elected president of the company. Mr. Bode was also president of the International Acetylene Association.



George Gorton, Sr., founder of the Gorton Machine Co.

Coming Events

MARCH 19-23—Industrial Exposition sponsored by the AMERICAN SOCIETY OF TOOL ENGINEERS to be held at the International Amphitheatre, Chicago, Ill. For further information write to Harry Conrad, executive secretary, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich.

APRIL 10-12—Twelfth annual meeting of the Metal Powder Association and 1956 METAL POWDER SHOW in Cleveland, Ohio, with head-quarters at the Hotel Cleveland. Additional information can be obtained from the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y.

MAY 9-11—National Spring Technical Meeting, and Welding and Allied Industry Fourth Exhibition of the AMERICAN WELDING SOCIETY will be held at Memorial Auditorium, Buffalo, N. Y. For further information write to the American Welding Society, Inc., 33 W. 39th St., New York 18, N. Y.

MAY 14-17—First Design Engineering Show will be held at Convention Hall, Philadelphia, Pa. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Available Motion Pictures

SURFACE FINISHES

A thirty-minute film report on the generation of precision functional surfaces has been prepared by the Micromatic Hone Corporation. The 16-millimeter sound motion picture, entitled "Progress in Precision," will be of special interest to industrial and technical organizations concerned with stock removal processes and precision and functional surface finishes. These groups may obtain copies of the film for showing by writing to the company's advertising department, 8100 Schoolcraft Ave., Detroit 38, Mich.

MULTIPLE-SLIDE STAMPING

A 16-millimeter motion picture entitled "U. S. Multi-Slides for the Production of Stampings" has been brought out by the U. S. Tool Co., Inc. This black and white sound film illustrates the construction features and the operating principles of the company's multiple-slide stamping machines. The film is available for loan to industrial companies, engineering societies, schools, and colleges. Requests should be made on company letterhead to the U. S. Tool Company, Inc., Ampere (East Orange), N. J.

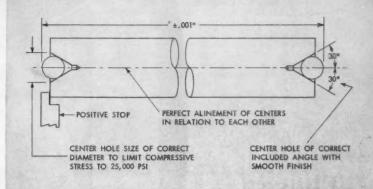
CENTERING IS CRITICAL

FOR TRACER AND AUTOMATIC LATHE PRODUCTION

The above sketch graphically highlights the centering "musts" for work to be automatically machined between centers.

Model CS Lo-swing Automatic Drilling and Centering Machine has the inbuilt features to provide all these requisites. It is designed for accurate centering on a continuous, high production basis, yet can be quickly and easily "changed-over" for short run jobs. Its 100% mechanical system provides positive, independent control of rapid traverse movements and drilling feeds. It has a fully automatic cycle and can be completely automated in a production line.

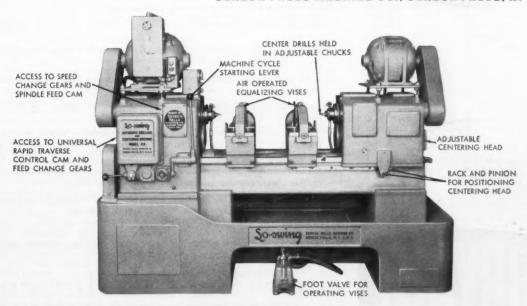
Write for your copy of Bulletin CS-54 which tells the whole story.



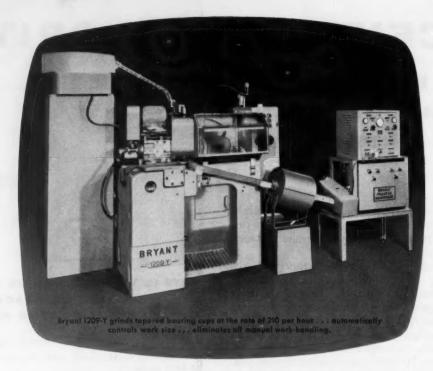
THIS IS WHAT MODEL CS WILL DO TO CUT COSTS ON TRACER AND AUTOMATIC LATHE PRODUCTION

- provide positive control of center depth to + .001".
- accurately locate work piece to assure correct center depth at both ends.
- guarantee correct angle and perfect alinement of center holes.
- produce a smooth, cleanly-finished center hole capable of positive contact with the surface of the center. This is accomplished by a unique design of the feed cam which withdraws the center drill near the end of the feed stroke to clear chips . . . and then feeds a few thousandths at reduced rate for a final finish cut.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.



So-swing model CS automatic centering machine



These extra features

... on BRYANT INTERNAL GRINDERS increase output, improve quality, cut costs!

MATERIAL: 52/00 STEEL-62 ROCKWELL "C"
FINISH REQUIRED: 10 RMS

Need volume production? small lot grinding? toolroom versatility? precision? Bryant grinders help you achieve all four. In addition, Bryant special equipment and features enable you to attain even broader flexibility and greater precision in your production.

Look into these Bryant cost-cutting features today . . .

- Bryant Process Controller provides automatic statistical quality control.
- Bryant Air Sizing provides automatic size control where extremely close tolerances must be held.
- Shoe Centerless Grinding—speeds up loading and unloading of work and eliminates distortion.
- Automatic Work Handling allows integration into automated production lines
- New Series 800 Bryant Hi-frequency Wheelheads supply smooth, trouble-free operation and plenty of power for the toughest grinding jobs, at speeds from 10,000 to 100,000 R. P. M.
- Exclusive, adjustable precision alignment features maintain original machine accuracy throughout the life of the machine.

Bryant offers three methods of acquisition: 1) outright purchase, 2) conditional sale (short term or long term), 3) lease.

BRYANT

For literature or more information on Bryant machines, special equipment and financing plans, write:

chucking grinder co-

20 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis · Cleveland · Chicago · Detroit · Mt. Vernon, N. Y. · Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates • Magnetic drum memory devices for computing systems

238-MACHINERY, January, 1956

For more information fill in page number on Inquiry Card, on page 221

New Books and Publications

HYDRAULIC AND PNEUMATIC POWER
FOR PRODUCTION. By Harry L.
Stewart. 416 pages, 6 by 9
inches, 348 illustrations and circuit diagrams. Published by
THE INDUSTRIAL PRESS, 93
Worth St., New York 13, N. Y.
Price, \$8.50.

There has been an increasing need for a good general reference book in this rapidly growing and complex field, that would supply information about the basic types of hydraulic and pneumatic equipment and the ways in which they can be applied to the control and actuation of production machinery. To meet this need, Harry L. Stewart of the Logansport Machine Co., Inc. has provided a comprehensive, well-illustrated, and clearly written reference book for designers, buyers, installers, and operators of hydraulic and

pneumatic equipment.

In the chapter on hydraulic fluids both petroleum oils and synthetic fluids are covered in considerable detail. Their various properties and the common difficulties encountered are discussed, and their remedies are analyzed. Succeeding chapters cover the various types of hydraulic pumps, filter units, purifiers, accumulators, pipe and tubing, valves, cylinders, intensifiers, motors, and heat exchangers. One chapter is devoted to the various methods of synchronizing the movement of fluid power rams, and another, to hydraulic safety controls. Ways in which sequencing can be obtained by the use of hydraulic controls are also analyzed.

A very thorough coverage of the various types of packings and seals follows the section on hydraulic equipment. These are illustrated in considerable detail and their various applications are clearly described.

In the latter part of the book air filters, lubricators, regulators, controls, and cylinders are taken up. Special chapters are devoted to pneumatic safety circuits and to remote control pneumatic systems. A chapter on power holding devices covers various types of hydraulic and pneumatic chucks and mandrels, as well as holding clamps of a wide variety of design.

Throughout the book there are

Throughout the book there are numerous illustrations of hydraulic and pneumatic equipment and a large number of circuit diagrams are described in step-by-step fashion.

This book should prove to be a valuable aid to those who are planning to purchase, install, or operate hydraulic or pneumatic equipment for production purposes. It will also serve as a useful reference to men engaged in fluid power work.

Following are the titles of the chapters in the book: The Evolution

of Fluid Power; Hydraulic Fluids; The Hydraulic Power Unit; Hydraulic Accumulators; Fluid Power Lines; Hydraulic Valves and Their Functions; Hydraulic Cylinders, Intensifiers, and Motors; Heat Exchangers for Hydraulic Systems; Synchronizing the Movement of Fluid Power Rams; Dual Pressure Hydraulic Systems; Safety Controls for Hydraulic Circuits; Sequencing of Hydraulic Cylinder Motion; Packings and Seals; Air Filters, Lubricators and Regulators; Pneumatic Controls; Air Cylinders and Their Design; Power-operated Holding Devices; Pneumatic Safety Circuits; Remote Control Pneumatic Systems; Combination of Fluids in a Single System.

HANDBOOK OF ENGINEERING MATERIALS. Edited by Douglas F. Miner, Director of Division of Student Personnel and Welfare, Carnegie Institute of Technology and John B. Seastone, Manager of the Research and Development Division of the Olin Mathieson Chemical Co. 1382 pages, 6 by 8 1/2 inches; approximately 450 illustrations. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$17.50.

This handbook provides a single source of authentic and useful information on the usual materials of manufacturing and construction. It presents sufficient data to form a useful guide to the selection of a wide range of materials and suggests sources for more complete information. In scope it is more complete than a technical dictionary but less detailed than special textbooks. It contains no historical background. Methods of manufacture of various materials have for the most part been omitted.

Compiled from the contributions of fifty-two men who are well versed in their respective fields, the handbook presents its material on a professional level, understandable to designers, engineers, research workers, and advanced students. It is not intended for the general public since it assumes basic technical knowledge and vocabulary.

The book contains four sections, each section having its own page numbers. The four sections and subdivisions contained therein are:

 General Information on Materials—Materials Specifications and Standards; Statistics in the Application of Materials; Mathematical and Physical Tables.

2. Metals—Ferrous Metals; Aluminum, Magnesium; Copper and Its Alloys; Zinc; Nickel and Its Alloys; Other Pure Metals; Special-Purpose Metals and Alloys.

3. Non-Metals—Wood and Wood-Base Materials; Paper; Fibers; Plastics and Rubbers; Organic Finishing Materials; Fuels; Carbon Products; Ceramic Materials; Industrial Chemicals; Lubricants.

4. Construction Materials—Cementing Materials; and Concrete; Roadbed Materials; Timber; Rope; Foundations; Weather and Moisture Protection; Glass Products.

Brazing Manual. Prepared by Committee on Brazing and Soldering, American Welding Society. 193 pages, 6 by 9 inches. Published by Reinhold Publishing Corporation, 430 Park Ave., New York 22, N. Y. Price, \$4.75.

Top experts have prepared a book on the subject of brazing that answers practically every type of brazing problem. Twenty-three chapters describe the principles, equipment, and procedures involved in the eight brazing processes; each operation from precleaning and surface preparation to postbraze cleaning and inspection; and the techniques of brazing aluminum, copper, magnesium, steels, iron, nickel, and other metals.

Special attention is given to joint design, to properties of base and filler metals, to fluxes and atmospheres, and to the cause of defects, together with corrective measures. Also included is a valuable quick-reference table showing metals in similar and dissimilar combinations, and filler metals to be used.

Chapter headings are as follows: Brazing Processes, Equipment and Procedures: Properties of Base Metals; Brazing Filler Metals; Fluxes and Atmospheres; Drafting Room Practices; Joint Design; Precleaning and Surface Preparation; Assembly; Technique of Brazing; Postbraze Operations; Inspection; Aluminum and Aluminum Alloys; Magnesium; Copper and Copper Alloys; Low-Carbon and Low-Alloy Steels; Stainless Steels; High-Carbon and High-Speed Tool Steels; Cast Irons; Heat-Resistant Alloys; Nickel and High-Nickel Alloys; Precious Metal Contacts; Other Metals; and Safety and Health Protection.

AMERICAN STANDARD SQUARE AND
HEXAGON BOLTS AND NUTS,
B18.2-1955. 31 pages; 8 1/2 by
11 inches. Published by the
American Society of Mechanical
Engineers; available from the
American Standards Association, 70 E. 45th St., New York
City. Price \$1.25.

The text is designed to help the buyer procure the right nuts and-bolts for the right uses. Approved by the American Standards Association, the document contains standard dimensions and tolerances for thir*teen nuts and eight bolts.

The standard has been revised to remove inconsistencies and to improve length tolerances. Included in the new edition is the American-British-Canadian agreement on dimensions for those bolts and nuts to be used in materials or equipment for

A METHOD FOR MAKING HOME PROJ-ECTS IN METAL. By L. H. Houck; 128 pages; 5 1/2 by 8 3/4 inches; plans for 80 projects. Published by the Lincoln Electric Co., Cleveland 17, Ohio. Price \$1.

The book shows what any householder with a home workshop can make with metal, and how to do it. A new welding method is also explained.

Photographs, plans, and sugges-tions show how to make many useful home products in maintenance, decoration, and furnishings: fences, shelves, flower stands, candle holders, grills, iron furniture, window fans, clothes driers, coffee tables, iron railings, television tables, or boat trailers. The projects all have been made in a home shop with few tools other than a work-table, hacksaw, and welder.

AMERICAN STANDARD CODE FOR PRESSURE PIPING (ASA B31.1-1955). 136 pages, 8 1/2 by 11 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, \$3.50. INDUSTRIAL FURNACES (Volume II). By W. Trinks. 358 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, \$10.

The third edition of this authoritative guide to the efficient operation of industrial furnaces contains a great deal of new material intended to bring readers abreast of the advances that have been made in this field since the previous edition was published. For example, the present book incorporates the latest available information on fuels and electrical energy, as well as devices for converting them into use for heat. The limits within which the temperature of the charge can be controlled are clarified, and many new types of burners are described in detail.

A discussion is included on improved mounting of electric heating elements and methods of calculating them. Equilibrium charts for oxidation and reduction of several metals, and a chart for carburization and decarburization of steels with various carbon contents have been added. There is a new section on the application of protective atmospheres, and many new labor-saving devices for moving material into, through, and out of furnaces are illustrated and described. Among the other material added may be mentioned a

description of new furnace types, as well as of changes in furnace design brought about by the wide distribution of natural gas through pipe lines. Included is also a whole new chapter on safety measures and

INSTRUMENTS FOR MEASUREMENT AND CONTROL. By Werner G. Holzbock. 371 pages, 6 by 9 inches. Published by the Reinhold Publishing Corporation, 430 Park Ave., New York 22, N. Y. Price, \$10.

The most recent devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc., are described in this new publication. The book discusses the design, construction, and operation of the instruments, shows how various instruments compare with each other, and points out the factors to consider in choosing the proper type for a particular job.

Fully covered are all the process variables and the commercially available instruments for their measurement; analytical process instrumentation; devices used in controller actions; and such final control elements as valves, pumps, transformers, and motors. A special chapter on trends discusses the development of centralized systems, miniaturization and digital computers.

Largest Vacuum Melting Furnace in Operation

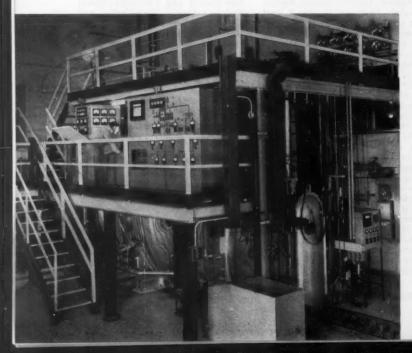
A vacuum melting furnaceclaimed to be the nation's largestis in operation at the Vacuum Metals Corporation, Syracuse, N. Y. Dwarfing the company's earlier 300and 600-pound furnaces, the new

unit has a capacity of 2200 pounds. Charging of the furnace, mold transfer, and pouring operations are remotely controlled by the melter from a single console. The melting unit is enclosed in a 3/4-inch thick

stainless steel chamber that is both air tight and liquid cooled. Air-lock chambers for charging raw materials and discharging ingots are connected to this main chamber. It is possible to charge the furnace, melt the charge, and pour and re-move ingots without affecting the vacuum in the melting chamber. A mold-handling mechanism makes it possible to cast ingots of various sizes and shapes, either singly or in multiples, from a single heat.

Alloys produced by this process are characterized by cleanliness and low gas content, resulting in higher elevated temperature strength and ductility and increased fatigue and impact strengths. These metals have proved superior for use in critical applications such as wheels and blades for turbo-jet engines, valve springs for reciprocating aircraft engines, races for instrument bearings, special magnetic alloys, and vacuum tubes for the electronics industry.

Tapping a 2200-pound capacity vacuum melting furnace. This semicontinuous furnace is remotely controlled from a single console and can be charged and poured without altering the vacuum in the melting chamber.

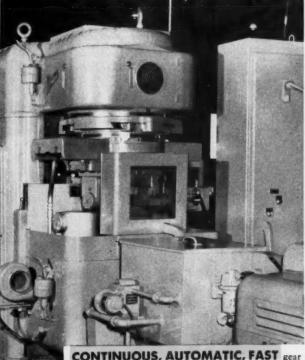


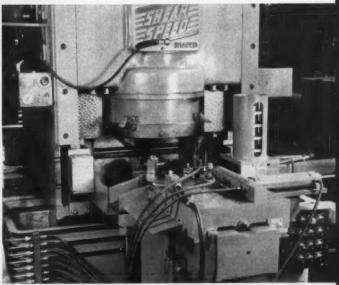
240—MACHINERY, January, 1956





NEW LARGER ROTO-FLO spline roller, Model 1551, is capable of cold rolling toothed parts with diameters up to 2 inches. Complete information on this fastest method of forming splines and similar toothed parts is given in Bulletin RF-55.





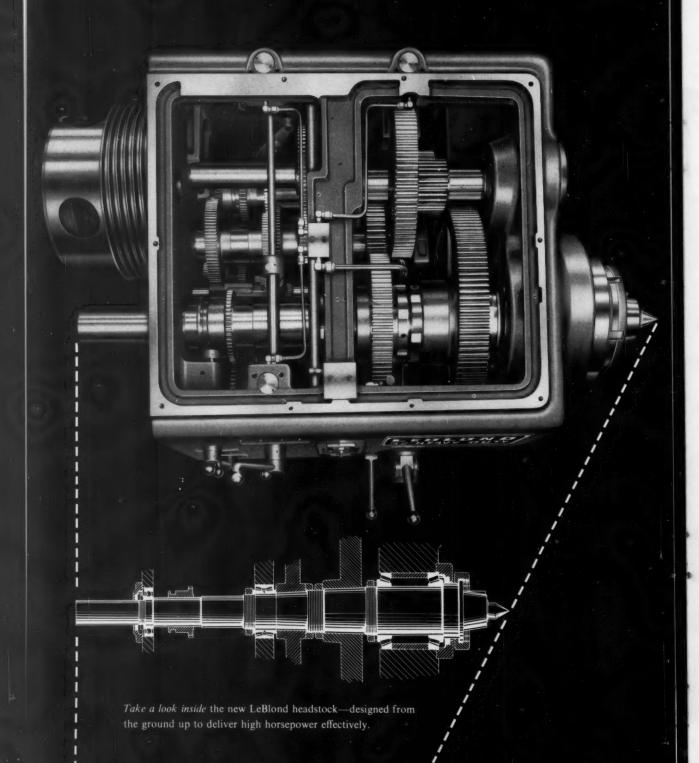
NEW AUTOMATIC LOADING for Shear-Speed gear shapers, plus automatic size control, offers completely automatic operation on all 1800 series models. Can be specified on new machines or added to Shear-Speeds now in the field.

continuous, automatic, FAST gear shaving on this Michigan 870-A gear finisher includes automatic size control, hopper feed, washing, and checking for correct size and helix angle. These Michigan gear shavers are used in continuous gear production lines—or in unitized groupings.

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS RD. . DETROIT 12, MICH.
IN CANADA: COLONIAL TOOL CO., LTD.

Designing LeBlond lathes for



60·HP turning was an inside job

This new headstock is the power secret of the LeBlond 32" Heavy Duty.

Notice how short and heavy the shafts are—to minimize deflection. Look at the fine-pitched, wide gears—for better tooth action and greater load-carrying capacity. They're hardened and ground for all speeds except low back gear. Free-running spur gear design assures minimum no-load friction horsepower. Shafts and gears not needed for a given speed remain idle, do not consume any power. The new 4-bearing spindle gives maximum rigidity, has twin Timkens at front, double-row Timken at center, ball bearing at rear.

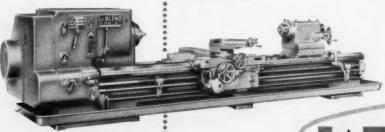
Of all the lathes in the world, the LeBlond 32" Heavy Duty was selected by a leading manufacturer of carbide tools, to be modified for grueling laboratory tests. Using 125 hp drive,

cuts were made with a measured 118 hp at the tool—210 cubic inches of SAE 1045 removed per minute!

Results like this call for a machine built in every detail for high-horsepower turning. The new headstock design is typical of the engineering in every element of the new LeBlond 32" Heavy Duty. The totally-enclosed quick change box, the hardened rack, 4-directional power rapid traverse, hardened and ground steel bedways, thrust-lock tailstock.

Whatever your turning needs—high power or high production, small swing or large—LeBlond makes a lathe you can trust with the job. 76 different models to choose from. Today, see your LeBlond Distributor or write—

36 speeds, new adjustable acceleration. From 4.5 to 500 rpm. New and exclusive adjustable acceleration brings heavy work pieces up to speed safely; any percentage of full torque can be selected for the first five seconds. Similar adjustments can be made for stopping and jogging, by means of three rheostatic controls to the electric clutch and electric brake. Hydra-Trace duplicating attachment optional. Write for Bulletin HD-165 for full details.



... cut with confidence

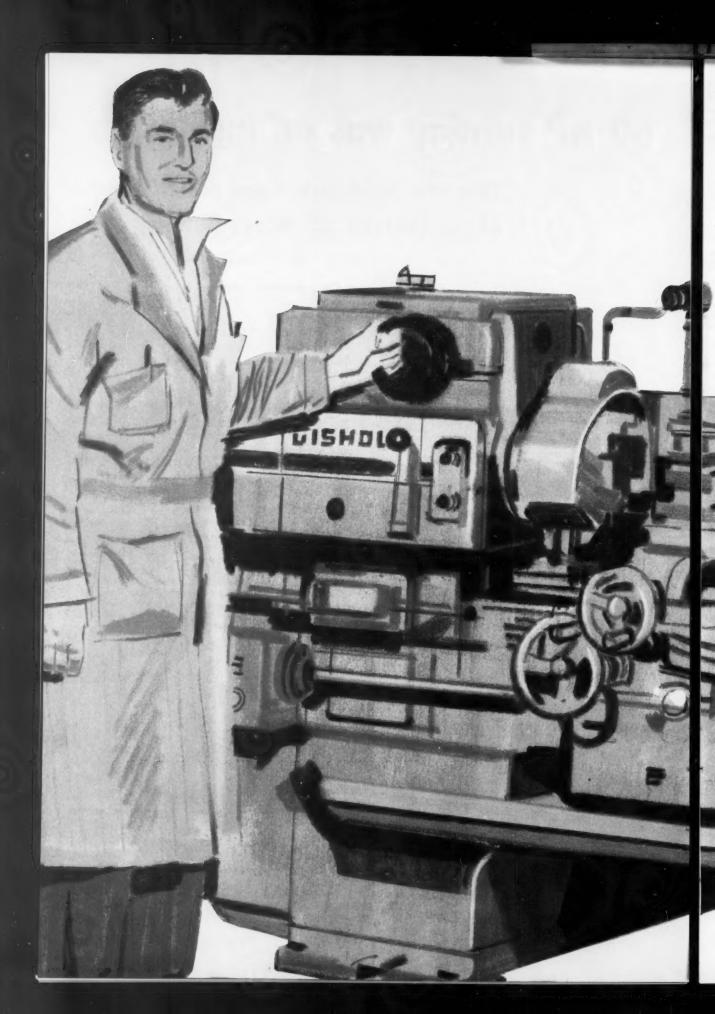
LEBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES . FOR MORE THAN 69 YEARS

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-243



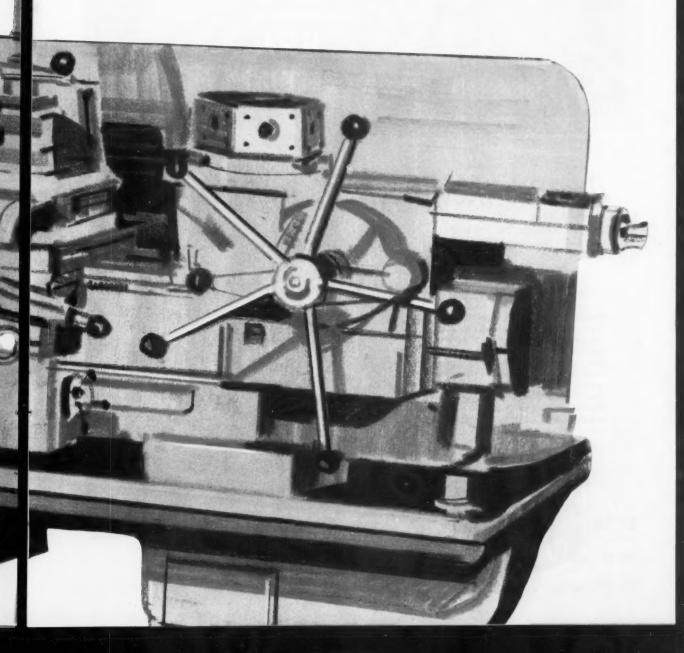
GISHOLT MASTERLINE RAM TYPE TURRET LATHE



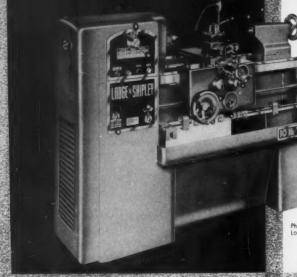
Here is the latest Gisholt MASTERLINE
Ram Type Turret Lathe, with many improvements and outstanding features to provide faster, easier operation, higher quality, quicker setup and lower maintenance. In short, it is designed to do your work faster, cheaper and better—and with a new minimum requirement for operator skill, attention and effort. Let us tell you more about these new machines, and discuss the possibilities of their profitable application to your particular manufacturing processes

Gisholt Machine Company, Madison 10, Wisconsin

Look ahead-keep ahead-with Gisholt



the finest high speed lathes



This is the NEW Lodge & Shipley 10" Hi Turn Lathe which joins the line famous for lathe leadership. It provides high speed turning, boring and facing capacity for production departments. For complete information, write for Bulletin 300, The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

deserve the finest precision chucks

This is Horton's 3-Jaw Scroll Universal Chuck which for over 100 years has been the ideal complement to the world's finest tool room, general purpose and production lathes. Its precision and lasting accuracy make it a part of any production picture. For the complete story on this and Horton's complete line of precision chucks, see the Horton people in your



WINDSOR LOCKS, CONN.

246-MACHINERY, January, 1956



From a background of more than 100 years of experience in building heavy metalworking equipment, Lodge & Shipley is producing power press brakes equal or superior to any other.

Built to Lodge & Shipley standards of strength and accuracy, for long service and minimum maintenance, these power press brakes offer many features which contribute to cost savings.

For example, the air clutch and spring brake is specifically designed for press brake service. The smoothly operating positive clutch is installed in a heavy, balanced flywheel. When the clutch is disengaged, the disc-type friction brake is automatically applied, positively holds the ram in any position.

Give yourself a better brake, check the many features of Lodge & Shipley power press brakes against any other power press brake . . . then make your decision.

Write for FREE Bulletin PB-4 and the name of your nearest distributor.

Lodge & Shipley

3057 COLERAIN AVE. • CINCINNATI 25, OHIO

MACHINERY, January, 1956-247

Series 350 Capacities from 8' x 5/8" to 20' x 1/4"

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations,

ABRASIVE CLOTH, Paper and Belt

Carborundum Co., Buffalo Ave., Niagara Falis, N. Y. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES

See Discs, Abrasive

ABRASIVES, HONING

Barnes Drill Co., 814 Chestnut St., Rockford,

ABRASIVES, Polishing, Tumbling, Etc.

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Macklin Co., 2925 Wildwood Ave., Jackson Mich. Norton Co., 1 New Bond St., Worcester 6. Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic

American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Caircinnati, Ohio. Baldwin-Lima-Hamilton Corp., Eddystone Div., Philodelphia 42, Pa. Bethlehem Steel Co., Bethlehem, Pa. Farrel-Birmingham Co., Inc., 25 Main St. Ansonia, Conn. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

N. Y. Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.

N. Y. Vickers Incorporated Division of Sperry Rand Corporation, 1402 Oakman Blvd., Detroit, Mich.

AIR HOISTS-See Hoists, Air

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS

ALLOY STEELS

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co., of America, Oliver Bldg., Pittsburgh 30, Pa. Steel Corp., 2313 Forbes St., Pittsburgh 30, Pa. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa. Vanadium Alloys Steel Co., Latrobe, Pa. Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature

Firth Sterling Inc., 3113 Forbes St., Pittsburgh

ALLOYS, Non-Ferrous

American Brass Co., 25 Broadway, New York. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. Mueller Brass Co., Port Huron 35, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ALLOYS, Zinc

New Jersey Zinc Co., 160 Front St., New York, N. Y.

ARBOR PRESSES

See Presses, Arbor

ARBORS AND MANDRELS

ARBORS AND MANDRELS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Brown & Sharpe Mfg. Co., Providence, R. I.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., Milwaukee, Wis.
Le Count Tool Works, Inc., 390-L Capital Ave.,
Hartford, Conn.
National Twist Drill & Tool Co., Rochester,
Mich.

National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford J., Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago B, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

(Continued on page 250)







... the preferred on every job for time-saving accuracy and dependability

Ames instruments have been making industrial measurement history for more than half a century. Extremely adaptable, they have solved hundreds of tough measuring jobs while providing unquestioned accuracy through many millions of cycles. Ames indicators and gauges enjoy a reputation as the finest you can buy . . . simply because we have always employed expert craftsmen and the highest quality materials.

We will gladly make recommendations on your measurement problems. Please send prints and specifications. And ask for your free copy of the Ames catalog.

Representatives in principal cities



27 Ames Street, Waltham 54, Mass.

MANUFACTURER OF MICROMETER DIAL GAUGES . MICROMETER DIAL INDICATORS

Boston Gear Works, 3200 Main St., North Quincy, Mass. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Ryerson, Jos. T. & Son, 2558 W. 16th St., Chicage 18, III.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa. Pa.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mach. Tool Co., 2531 11th St.,
Rockford, Ill.
Thor Power Tool Co., Aurora, Illinois

BALLS

Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

BARS, Steel

BARS, Steel

Allegheney Ludium Steel Corp., Bethlehem, Pa. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

Timken Roller Bearing Co., Canton, Ohio
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich. Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio

BEARINGS, BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

BEARINGS, Ball

BEAKINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Fafnir Bearing Co., New Britain, Conn.
Marlin-Rockwell Corp., 402 Chandler Bldg.,
Jamestown, N. Y.
New Departure Div., General Motors, Bristol,
Conn.
Nice Ball Bearing Co., Nicetown, Philadelphia,
Pa. Norma-Hoffman Bearings Corp., Stamford, Conn.

BEARINGS, Bronze and Special Alloy
Boston Gear Works, 3200 Main St., North Boston Gear Works, 3200 Main St., North Quincy, Mass. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn. Orange Roller Bearing Co., Inc., Orange, N. J. Standard Pressed Steel Co., Jenkintown, Pa. (Continued on page 252)

250-MACHINERY, January, 1956

Again...

MERCURY INTRODUCES A NEW

Combined Production Method

GRIND FLASH AND FINS

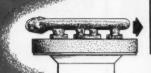
Opposed grinding heads, straddling a conveyor, remove flash and fins from exhaust manifold part faces.

GRIND MOUNTING FACE

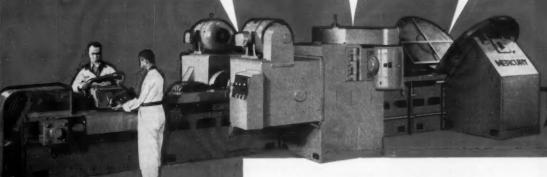
Two vertically mounted grinding heads remove flash from exhaust pipe mounting face.

PUNCH FLASH AND FINS

Two retary punches, timed with the conveyor, punch out flash and fins between crafting extensions.







1000 Pieces Per Hour

This high-speed Mercury conveyorized combination grinding and punching line accepts four different types of manifolds without fixture change-over. Each casting is automatically positioned for the three operations described. An automatic unloading device places the manifolds upon a conveyor at a sustained rate of 1000 pieces per hour.

A STMBOL OF FINE CRAFTS MAMSHIP

MERCURY - Designers and Builders of Special Grinding Machines

MERCURY

ENGINEERING CORPORATION

Milwaukee 2, Wisconsin

Your Inquiry Is Invited



- WITH THE OLIVER ACE CUTTER GRINDER TWO FIXTURES HANDLE A COMPLETE RANGE OF TOOL AND CUTTER GRINDING
- STANDARD MODEL AVAILABLE FOR HIGH SPEED AND LIGHT DUTY CARBIDE GRINDING
- HEAVY DUTY MODEL SUPPLIED FOR TUNGSTEN-CARBIDE CUTTERS AND TOOLS.
- AUTOMATIC TRUEING-THE GRINDING WHEEL FEEDS DOWN TO A DIAMOND TO MAINTAIN A FIXED GRINDING LINE.
- SHARPENS STRAIGHT OR TAPERED REAMERS, SPOT FACERS, COUNTERBORES AND END MILLS.
- SHARPENS STANDARD MILLING CUTTERS, STAGGERED-TOOTH CUTTERS AND DOUBLE ANGLE CUTTERS.
- GRINDS THE FACE, CORNER ANGLE, AND PERIPHERY ON
- FIXTURES AVAILABLE FOR POINT THINNING, RADIUS GRINDING, SMALL END MILL GRINDING AND BROACH

Keep Edges Sharp and Accurate on Cutters Like These . . . Write For Complete Information.









1410 EAST MAUMEE



ADRIAN, MICHIGAN

FACE MILL GRINDERS . AUTOMATIC DRILL GRINDERS . DIE MAKING MACHINES TOOL & CUTTER GRINDERS - DRILL POINT THINNERS - TEMPLATE TOOL GRINDERS

BEARINGS, Needle

Orange Roller Bearing Co., Inc., Orange, N. J.

BEARINGS, Roller

BEARINGS, Roller Bearing Co., Danbury, Conn. Fafnir Bearing Co., New Britain, Conn. Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y. Norma-Hoffman Bearings Corp., Stamford, Conn. Orange Roller Bearing Co., Inc., Orange, N. J. Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y. Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Self Lubricating (Oilness)

Boston Gear Works, 3200 Main St., North Quincy, Mass. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio.

BEARINGS, Tapered Roller

Timken Roller Bearing Co., Canton, Ohio.

BEARINGS, Thrust

Ball & Roller Bearing Co., Danbury, Conn. Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio. Fafnir Bearing Co., New Britain, Conn., General Electric Co., Schenectady, N. Y. Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N., V. Nice Ball Bearing Co., Nicetown, Philadelphia, Park. McConn. Pa.
Norma-Hoffman Bearings Corp., Stamford,
Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearing Co., Inc., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.

BELT SHIFTERS

Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, Transmission

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

BENCHES, Work, and Bench Legs

Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.

Plate, Etc.
Consolidated Mch. Tool Corp., 656 Blossom
Rd., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
III.
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Wallace Supplies Mfg. Co., 1304-08 Diversey
Pkwy., Chicago, III.

BENDING MACHINES, Hydroulic

PERDING MACHINES, Hydraulic

American Steel Foundries, Elmes Engra. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati,
Ohio.

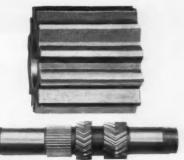
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethiehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Chambershura, Engra. Co., Chambershura, Pa. Chambersburg Engrg. Co., Chambersburg, Pa. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Ill'aulic Press Mfg. Co., Mount Gilead, Ohio Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y. Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y. Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III. Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy, Chicago, III.

BENDING MACHINES, Pipe

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy, Chicago, III.

BLAST CLEANING EQUIPMENT

Modern Ind., Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich. Pangborn Corp., Hogerstown, Md., Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y (Continued on page 254)



8 PRECISION GEARS

...all generated on a single Farrel-Sykes machine

Those eight gears should give you some idea of the versatility of a Farrel-Sykes "Twin-Head" generator.

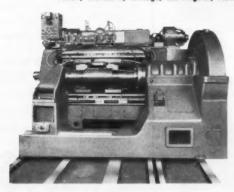
The gear machine is made with the work axis horizontal, the position in which the gears themselves run. This permits a wide variety of work to be handled on a single generator—controls the work positively, too.

Built with high initial precision, "Twin-Head" generators are provided with means of compensating for wear and sustaining accuracy for thousands of operating-hours. Other important benefits are faster cutting speed, reduced setup time, and ease of operation.

Write for details of this versatile gear generator, today.

FARREL-BIRMINGHAM COMPANY, INC.

Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Cambridge (Mass.),
Akron, Cleveland, Chicago, Los Angeles, Houston













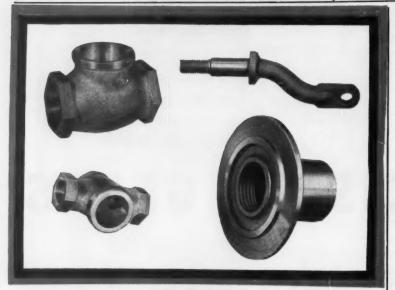


Types of gears illustrated (from top to bottom):
spur • gear component with integral shaft • continuous-tooth herringbone
• single helical • double helical with staggered teeth • double helical, staggered-tooth, with center groove • herringbone rack and pinion • cluster.

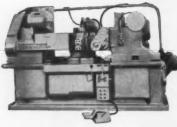
Farrel-Birmingham

FB-1032

MACHINERY, January, 1956-253

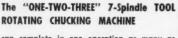


PLAN PRODUCTION of PARTS LIKE THESE and MANY OTHERS . . . for speed, convenience and economy on GOSS & DeLEEUW **AUTOMATIC CHUCKERS**



4-SPINDLE TOOL ROTATING CHUCKING MACHINES.

available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended parts.



can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.





Send samples of your work for time estimates. Ask for illustrated literature.

GOSS and DE LEEUW

MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. Ingersoil-Rand Co., Phillipsburg, N. J. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BLUING LAYOUT

Dykem Co., 2303P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES

Bethlehem Steel Co., Bethlehem, Pa. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III. U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Landis Machine Co., Inc., Waynesboro, Pa. National Machinery Co., Tiffin, Ohio. New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLT AND NUTS

Bethlehem Steel Co., Bethlehem, Pa. National Acme Co., 170 E. 131st St., Cleve-land, Ohio. Ottemiller, W. H., & Co., York, Pa. Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOOKS, Technical

Industrial Press, 148 Lafayette St., New York 13, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio. McGraw-Hill Book Co., 327 W. 41 St., New York 36, N. Y.

BORING AND DRILLING MACHINES

BORING AND DRILLING MACHINES
Baker Bros., Inc., Sta. F, P. O. Box 101,
Toledo 10, Ohio.
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cincinnati Lathe & Tool Co., 3207-3211 Disney
St., Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit
32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland
B, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blivd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Defroit 7, Mich.
Wales-Strippet Corp., North Tonawanda, N. Y.

BORING AND TURNING MILLS, Vertical

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford Conn. Bullard Co., Brewster St., Bridgeport 2, Conn. Cosa Copp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Bivd., Detroit 32, Mich. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.
Young Mch. Tool Div., Church Rd., Bridgeport, Pa. American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave.,

(Continued on page 256)



U SHAPED



Exclusive with Etna is the cluster unit. This unit progressively rolls the tube into shape without excessive stretching of the edges, thereby eliminating the "buckling" experienced with ordinary tube mills. Etna machines are not forming mills bey are designed for one purpose only . . . to make clear, well formed carbon and stainless steel tubing with no marking, no scratching, no upset edges. Write for complete details.



ROUND

The ETNA 4KU Mill

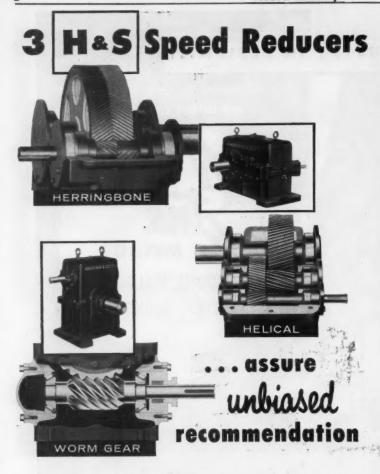
Abbey

ET Company

3422 MAPLEWOOD AVE., TOLEDO 10, OHIO

For more information fill in page number on inquiry Card, on page 221

MACHINERY, January, 1956-255



Each of these three general groups of H&S Speed Reducers has its particular mechanical advantages which make it more efficient for specific duties. There are many considerations, such as speed of driving and driven shafts, shape of housing and drive characteristics that must be considered for lasting reducer performance and economy.

With the complete H & S line of Speed Reducers to choose from, you can be sure of our unbiased recommendation and your selection of the right type reducer for each specific job.

H & S Reducers are available in single reduction units in ratios up to 100 to 1; in combination units up to 700 to 1; and in double reduction units up to 10,000 to 1.

Make H & S your source for all speed reducing requirements.



Send note on Company Letterhead for complete H & S Catalog

BORING BARS

BORING BARS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Arve, Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. X-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ingersoll Milling Mach. Co., 2442 Douglas St., Rockford, Ill.
Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero 50, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffala 7, N. Y.

BORING, DRILLING AND MILLING MACHINES, Horizontol

(Floor, Planer or Table Types) (Floor, Planer or Table Types)
Cincinnati, Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit
32, Mich.
Giddings & Lewis Machine Tool Co., Fond du
Lac., Wis.
Gray, G. A., Co., Woodburn Ave., and Penn.
R. R. Evanston, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Innocenti Corp., 43 W. 61st St., New York 23,
N. Y.
Lucas Mch. Tool Div., New Britain Mch. Co., N. Y.
Lucas Mch. Tool Div., New Britain Mch. Co.,
12302 Kirby Ave., Cleveland 8, Ohio.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Portage Machine Co., 1069 Sweitzer Ave.,
Akron 11, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroits, 7, Mich.

BORING HEADS

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

Davis Boring Tool Div., Giddings & Lewis Machine tool Co., Fond du Lac, Wis. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis S., Ind.

Mummert-Dixon Co., Hanover, Pa.

Precision Tool & Mfg. Co., 1305 S. Laramle, Clearo 50, Ill.

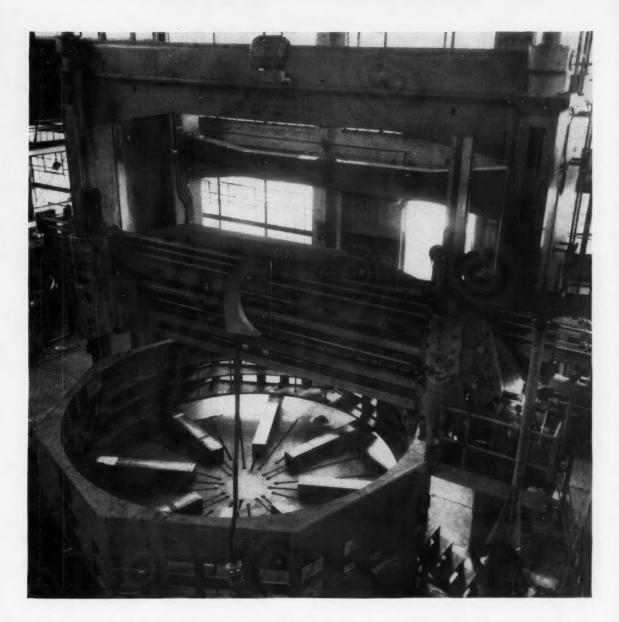
Taft-Peirce Mfg. Co., Woonsocket, R. I.

Universal Engineering Co., Frankenmuth 2, Milch.

Wesson Co., 1220 Woodward Helghts Blvd., Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

BORING MACHINES
Bryant Chucking Grinder Co., Springfield, Vt.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Ookman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bon St., Worcester 6, Mass.
Michigan Driil Head Co., Detroit 34, Mich.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engra Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmand, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Con.
Wadell Equipment Co., 119 So. Ave., Garwood, N. J.
Young Mch. Tool Div., Church Rd., Bridgeport, Young Mch. Tool Div., Church Rd., Bridgeport, (Continued on page 258)



35-year-old Niles mill sells Elliott new Niles 30-ft. boring mill

The remarkable performance since 1920 of a Niles 20-ft. vertical boring mill was responsible for Elliott Company's selection of a new, modern Niles 30-ft. mill. Installed primarily for machining blowers, turbines and condensers built at their Jeannette, Pa. plant, and large generator stator frames for their Ridgeway Division, this large vertical boring mill is also available for outside contract work.

The new Niles has a 16-ft. clearance under the crossrail. It's equipped with two 9-ft. travel rams and a 19-ft. 6-in. table. Other features include electronic feed control and electrically operated clamps which minimize set-up time and hold settings rigidly accurate. Over-counterweighing the

rams takes up backlash in the feed gears at all times, thus insuring dimensional tolerances within .001 and .002 to be maintained across large surfaces.

Elliott also expects to use such other features as compound feeding and 60° swing of the boring rams to install electronic-hydraulic duplicating equipment on the mill. This will enable them to do contour or profiling work, thus increasing the machine's versatility and adaptability for a wide variety of work.

You too will find these exclusive features of Niles machine tools all add up to greater production and higher quality. For further details write today for our new eight-page booklet. Hamilton Division, Baldwin-Lima-Hamilton Corporation, Hamilton, Ohio.



Lages 4-POST RAM TYPE DRILLING MACHINES

RELEASE HIGH COST DRILL PRESSES

FOR OTHER IMPORTANT JOBS

 Zagar hydraulic drilling machines are designed for high speed drillingfor both production and limited runs. Zagar 4-post machines reduce high

> cost tooling, and handle a range of work that ordinarily necessitates the use of several different machines. Very important, Zagar drilling machines release capital equipment for other purposes. Zagar 4-post machines lower your capital investment. They quickly pay out. What, sir, are your production requirements?

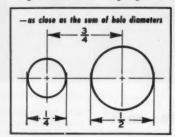
Zagar hydraulic ram-type 4-post machine drills 150 holes, 1/4" through 5/8" dia., in aluminum casting at one pass.

GEARLESS DRILL HEADS

are the answer to close-center drilling on your own equipment



1000 spindles, drilling simultaneously, are possible with Zagar gearless drill heads. Any pattern drilling any machinable material is standard practice; any size up to 11/2" dia.... Zagar can design the tooling for the entire drilling job; or, a Zagar



gearless drill head can be used on your existing drill press. Zagar engineering is flexible enough to recommend and supply the answer that will cost the least and produce the most.

Ask for Zagar Catalog "M-1"

ZAGAR TOOL, INC.

23888 LAKELAND BLVD.

CLEVELAND 23, OHIO



TOOLS FOR INDUSTRY and SPECIAL MACHINERY

BORING MACHINES, Jig

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York
17, N.,
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnonti, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave.,
Bridgeport, Conn.,
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Prott & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 1, N.,
Triplax Machine Tool Corp., 75 West St., New
York 6, N. P.
Vales-Strippet Corp., North Tonawanda, N. Y.

BORING TOOLS

BORING TOOLS

American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

The Afrax Co. (Carbide), 240 Day St., Newington II, Conn.

Bullard Co., Brewster St., Bridgeport 2, Conn. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

1917 Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.

Stellite Div. Union Carbide & Carbon Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. Kennametal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown Ohio. Precision Tool & Mfg. Co., 1305 S. Laramie, Cicero So, Ill.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.

Union Twist Drill Co., Athol, Mass.

Universal Engineering Co., Frankenmuth 2, Mich.

Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

BRAKES, Press and Bending

Bliss, E. W., Co., 1375 Raff Road, S. W.
Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Peris & Krump Mfg. Co., 7416 Loomis Blvd.,
Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.,
Hamilton Div. of the Lodge & Shipley Co.,
Hamilton I., Ohio.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich. Mich.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta, Detroit 13, Mich.
Detroit Broach Co., Detroit, Mich.
duMont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson,
Mass. 32, Mich.
Lapointe Mch. Tl. Co., Tower St., Hudson,
Mass.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Zogar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mich. Co., Ann Arbor, Mich. Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Detroit Broach Co., P. O. Box 156, Rochester,
Mich.
Foote-Burt Co., 130 St. Clair Ave., Cleveland
8, Ohio.

the acknowledged leader in the field of Broaching, offers you

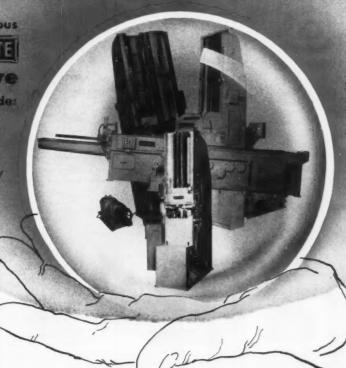
fomorrow's BROACHING MACHINES

They're all built with the famous

electro-motive drive

and provide:

- Amazing increases in production;
- Elimination of chatter;
- Measurable improvement in quality of work;
- Possibility of carbide tooling;
- Added tool life between grinds;
- Substantial reduction in production costs.



In considering a Broaching Machine, remember this:

- DON'T BUY a machine that may soon be out of date; broaching speeds are no longer limited to the old concepts
 - speeds of the future are now up to 300 feet-per-minute, and more!

DON'T BUY an "experiment" - get a proven machine, from the company whose electro-motive drive broaching machines have been used on production lines for the past five years!

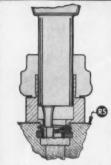
Write for literature.



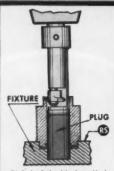


THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROAGHING MACHINES AND BROAGHES

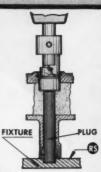
Even Unskilled Labor Can Use This Versatile **Tool Accurately! It Simplifies Internal Grooving Problems, Cuts Production Costs!**



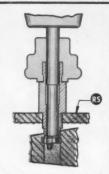
A) Cuts two grooves of dif-ferent depths and widths in one single operation from same reference surface.



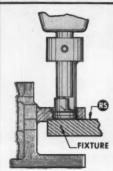
B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.



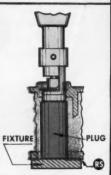
C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.



D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.



E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.



F) Cuts groove in a bore from inaccessible reference sur-face eliminating facing oper-ation. Tool banks on plug set ation. Too in fixture.

Amazingly versatile! Your toughest recess cutting problems can be met simply and efficiently with the Waldes Truarc Grooving Tool because it offers a whole range of possibilities beyond the range of ordinary recessing tools.

Wide Cutting Range! The Waldes Truarc Grooving Tool comes in 5 models...enabling you to cut accurate grooves in housings with diameters from .250 to 5.00 inches.

Send Your Problems to Waldes! Send us your blueprints...let Waldes Truarc Engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job. There is no obligation!

Write NOW for a 20-page manual containing full information on Waldes Truorc Greaving Tool



GROOVING TOOL

WALDES KOHINGOR, INC., 47-16 Austel Place, L. I. C. 1, N. Y. Waldes Truerc Greaving Tool Manufactured Under U. S. Pat. 2,411,426

MRIEST VO	hinser, Inc.	, 47-16 Auste	i Pl., L.	I.C. 1, 1
Please send me your new 20-page technical n on the Waldes Truarc Grooving Tool, (GT				
Name				
Title				
Company_	7			25-5
		PURELEC		
Address		-		_

Lapointe Mch. Tl. Co., Tower St., Hudson, Mass. Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y. Zagar Tool Inc., 24000 Lakeland Blvd., Cleve-land 23, Ohio.

American Brass Co., Waterbury 20, Conn. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Mueller Brass Co., Port Huron 35, Mich.

BRUSHES, Industrial, Wire Wheel, Etc. Osborn Mfg. Co., 5401 Hamilton Ave., Cleve-land, Ohlo. Pittsburgh Plate Glass Co., Brush Div., Balti-more 29, Md.

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

BULLDOZERS

BULLDOZERS

Ajax Mfg, Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Lake Erie Engineering Corp., Kenmore Station,
Buffalo, N. Y.
Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohio. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

Dunly Machine Specialties, Inc., 2107 S. 52nd Ave, Chicago 50, Ill. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Leland-Gifford Co., 1925 Southbridge St., Worcester, Mass. U. S. Steel Co., Inc., 436 7th Ave., Pittsburgh, P. S., Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

CALIPERS

CALIFERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave, Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.,
Storrett, The L. S. Co., Athol, Mass.
Taff-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Casa Corp., 405 Lexington Ave., New York 17, N. Y. Fellows Gear Shaper Co., Springfield, Vt. Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa. Pratt & Whitney, West Hartford 1, Conn. Sunstrand Machine Tool Co., 2351 11th St., Rockford, III.

(Continued on page 262)





CAM MILLING AND GRINDING MACHINES

Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Cincinnati Milling Machine Co., Oakley, Cincin-

ford, Conn.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J. N. J. Hartford Special Machry. Co., 287 Homestead Aves., Hartford, Conn. Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa. Jarvis Corp., Middletown, Conn. Kennametal, Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Metal Carbon Co., 21650 Hoover Rd., Detroit Co., Mich.
Mich.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Corp., 1340 W. Vernon
Hwy., Detroit 1, Mich.

CASEHARDENING FURNACES

See Furnaces, Heat-Treating

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Bethiehem Steel Co. (Brass and Bronze only), Bethiehem, Pa. Bunting Brass & Bronze Co., Spencer and Carl-ton Aves., Toledo, Ohia. Mueller Brass Co., Port Huron 35, Mich.

CASTINGS, DIE

American Brass Co., Waterbury 20, Conn. Madison-Kipp Corp., Madison, Wisc.

CASTINGS, Iron

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Brown & Sharpe Mfg. Co., Providence, R. I. Chambersburg Engineering Co., Chambersburg, Pa.

CASTINGS, Steel, Alloys, Etc.

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Bethlehem Steel Co., Bethlehem, Pa. Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel

Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

CENTERING MACHINES

CENTERING MACHINES
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio,
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and
Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolls 5, Ind.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St.,
Rockford, Ill.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.

(Continued on page 264)

(Continued on page 264)

Feed Screws
Jack Screws
Lead Screws
Return Screws
Metering Screws
Power Screws
Elevating Screws



SCREWS

any type...any size... any quantity!

Square threads, acme threads, buttress threads, V-threads, ground threads—one screw, or ten thousand or more—whatever you need, you can get it at Illinois Gear!

If you want highest quality and precision, plus on-time delivery (even if we have to work around-the-clock to meet your emergencies), then send your next order to Illinois Gear!



Look for this mark ... the symbol on finer gears



Gears for Every Purpose ... one gear or 10,000 or more

ILLINOIS GEAR & MACHINE COMPANY

2108 NORTH NATCHEZ AVENUE . CHICAGO 35, ILLINOIS

CENTERS, Lathe Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Besty-Welles Corp., 112 Dearborn Ave., Beloit,

Axelson Mrg. Cu., Brown St. Axelson Mrg. Cu., Brown St. Angeles 5B. Cal.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wls.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., Cleveland, Ohio.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wessen Co., 1220 Woodward Heights Blvd.,

St., South Co., 21650 Hoover Ru., Super Tool Co., 21650 Hoover Ru., Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Union Twist Drill Co., Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

Conveyor Boston Gear Works, 3200 Main St., North Quincy, Mass.

Philadelphia Gear Works, Erie Ave. and G St., Philadelphia Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.

CHUCKING MACHINES

CHUCKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Con., 6160 Stratford Ave., Stratford, Con., 6160 Stratford Ave., Stratford, Con., 6160 Stratford Ave., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn. Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lameon Mch. Co., 160 Clinton St., Springfield, Vt.

National Acme Co. (Single and Multiple Spindle), 170 E. 131st St., Cleveland, Ohio. Potter and Johnson Co., 1027 Newport Ave., Pawtucket, R. Sundstrand Mch. Tool Co., 2531 11th St., Rock-ford, III. Warner & Wassey Co., 5701 Carnegie Ave., Cleveland 83, Ohio.

CHUCKS, Air Operated

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Cushman Chuck Co., Windsor Ave., Hartford 2, Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholf Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Schraders Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Gleason Works, 1000 University Ave., Roches-ter, N. Y. Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck
Co., 344 Church St., New
Britain, Conn.

CHUCKS, Full Floating

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y. Gisholt Mch. Co., Madison 10, Wis. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Gear

Gleason Works, 1000 University Ave., Rochester, N. Y.
Horton Chuck, Windsor Locks, Conn.

CHUCKS, Lathes, etc.

CHUCKS, Lathes, etc.

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

Bullard Co., Brewster St., Bridgeport 2, Conn. Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.

Gisholt Mch. Co., Madison 10, Wis.

Horton Chuck, Windsor Locks, Conn.

Jacobs Mfg. Co., West Hartford, Conn.

Jones & Lamson Mch. Co., Springfield, Vt.

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Moss.

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

Skinner Chuck Co., 344 Church St., New Britain, Conn.

South Bend, Ind.

Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

(Continued on page 266)

(Continued on page 266)

BUILT

to Turn out PROFITS

Sheldon Lathes are designed and built to do accurate lathe work rapidly and profitably. Moderate in price they have the collet, swing and power capacity to de mest toolroom work

Design Features: Large and wide sion"Tapered

Roller Spindle Bearings-permit operation at all speeds, retain accuracy, end expensive bearing main tenance costs.

• 54-pitch Gear Box—gives both standard and many hard to get thread ratios.

• Extra Collet Capacity -1 1%" hole

· More Power to Spindle-Efficient drives with bigger meters and double neoprene cog V-belts to



UMS6P 13" Swing Lathe 34" Between Centers Rapid Shifting "U" Drive UM56P \$1615.00 BASE PRICE F.O.B. CHICAGO OPTIONAL FEATURES AT EXTRA COST include: Hardened ways, Long Tapered Key Drive Spindles, 4"

D1 Camlock Spindles bed turrets, collet attachments, and other production and toolroom accessories. Lathes available with a choice of "Bench," "Cabinet" or "Pedestal" mountings.

Write for New Catalog G-55

4246 N. Knox Ave.

Chicago 41, Illinois





At Wendel Research & Mfg. Corp.

Shell Dromus Oil E increases tool life 60%, provides better cooling and increased production

Wendel Research & Mfg. Corp., Albertson, New York, encountered extremely short tool life when drilling A.I.S.I. 4140 steel used in the manufacture of pilot ejection seats. They also experienced broken bits, chip welding, discoloration and burning of the tools. Shell Dromus Oil E was recommended to combat these difficulties. Here are the results:

Dromus Oil E immediately ended Wendel's trouble. The drill and steel bar stock were very cool and easy to handle. Chip settling was excellent, and discoloration of tools and work was completely eliminated.

Here are some of the outstanding features of Dromus Oil E:

- Excellent wetting and cooling properties wets all metal surfaces extremely fast.
- 2. Provides longer tool life—better finish.
- Not sticky or greasy—keeps tools and work exceptionally cool.
- Forms a solution, not an emulsion . . . is stable in any concentration.
- Easy to mix in hot or cold, hard or soft water.

Write for information on Shell Dromus Oil E. See how it can help you increase tool life.

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK 100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA



CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III. Hanchett Magna-Lock Corp., Big Rapids, Mich. Taft-Peirce Mfg. Co., Woonsocket, R. I. Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Frington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Errington Mechanical Laboratory, 24 Norwood
Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn. Errington Mechanists, N., N. Y.
Ave., Stopleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
Jarvis Corp., Middletown, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.

CLAMPS

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Precision Tool & Mfg. Co., 1305 S. Laramie,
Cicero 50, III.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Specialties Co., 4114 N. Knox Ave., Chicago
41, III.
Starrett, The L. S., Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo
7, N. Y.

CLEANERS, Chemical, for Metal

Bullard Co., Bullard-Dunn Process Div., Brew-ster St., Bridgeport 2, Conn. Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, III.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y. Custe, N. Y. Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, III.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.
Verson Allsteel Press Co., 93rd St. & S. Ken-Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.

COLLARS, Safety

Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

COLLETS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Frown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.
Cleveland Automatic Machine Co., 4932 Beech St. Cincinnati 12, Ohio.
DoAlf Co., 254 N. Laurel Ave., Des Plaines, III.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35 Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, III.
South Bend, Lothe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Lones Engrg. Co., Frankenmuth 2, Mich.
Lagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS, Optical

DoAll Co., 254 Laurel Ave., Des Plaines, III. Eastman Kodak Co., Rochester, N. Y., Jones & Lamson Mch. Co., Springfield, Vt. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

Citles Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lopping).

(Continued on page 270)



for accuracy in your production it pays to specify

UNIVERSAL DRILL **BUSHINGS**

In Universal you get the best. Machined from finest quality steel. Blended radius on the topinside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip.



longthen tool life

The superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum-especially in close tolerance work.

> Standard sizes and lengths in stock for immediate delivery. Contact the office nearest you-Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.-or our home office.



FRANKENMUTH 2, MICHIGAN

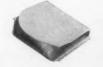
catalog describing Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, "Kwik-Switch" Tool Hold Mikro-Lok Baring Bars, Standard Drill Bushings, Universal In-

UNIVERSAL ENGINEERING COMPAN

For Deep Drawn Parts ... H-P-M

H-P-M Hydraulics Prove Their Versatility At Massey-Harris-Ferguson, Inc.

These three big H-P-M presses (the third just recently installed) are doing a "bang-up" job drawing deep, intricate parts for the famed Massey-Harris-Ferguson line of tractors and farm equipment. As a result the number of drawing operations has been greatly reduced, thus speeding up production . . . fewer dies, less press equipment, smaller factory space and less manpower have cut factory overhead. Due to their great versatility, these presses are used for all types of shallow and deep drawn parts and for short or long runs.



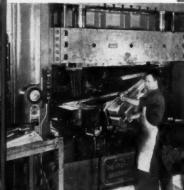




Two dies used simultaneously; at right, flange contour is trimmed while at left hole is punched in shallow end.

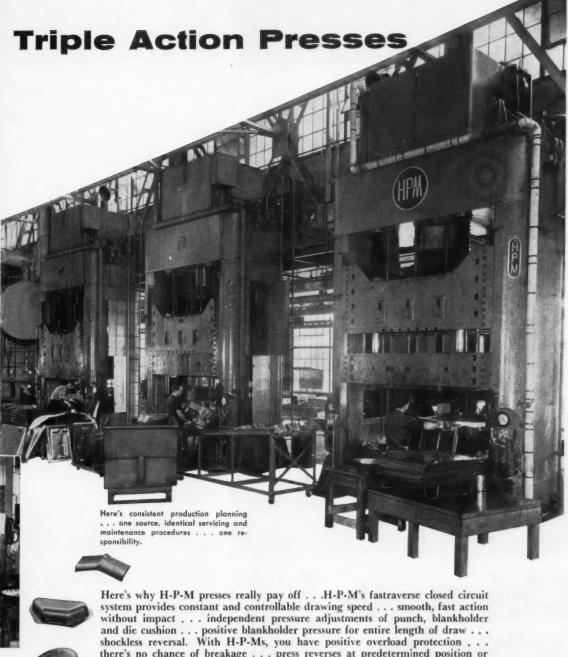


This die first forms fender brackets to desired shape and then forms flange into channel section—strong and rigid—in the same press stroke.



The fuel tank is drawn by this H-P-M. This 18 gauge part is sent to another trimming press by chute at left . . . one draw and the part is formed.



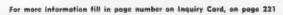


and die cushion . . . positive blankholder pressure for entire length of draw . . . shockless reversal. With H-P-Ms, you have positive overload protection . . . there's no chance of breakage . . . press reverses at predetermined position or pressure. H-P-Ms also permit quicker die set up. You, too, can eliminate the guesswork . . . choose H-P-Ms for all your metalworking needs. Write today for complete information.

METAL WORKING DIVISION

THE HYDRAULIC PRESS MFG. CO.

Mount Gilriad, Ohio, U.S.A.





MEMO:

To: Production - Bill H.

FROM: Purchasing

Bill - Regarding that Carbide called about - I've checked checago Latrobe service - Engineer.

trouble shooters on this kind

Chicago-Latrobe makes carbide drills and reamers of a quality that is unsurpassed—in a complete line and backs these tools with the kind of service that keeps the production line running. Try them and see.

CARBIDE DRILLS and REAMERS



Stocked and sold by service-minded Industrial Distributors

CHICAGO-LATROBE

417 W. ONTARIO STREET . CHICAGO 10, ILLINOIS REAMERS . CONNTERSINKS . CONNTERBORES . SPECIAL TO

Oakite Products, Inc., 19 Rector St., New York, N. Y. Shell Oil Co., 50 W. 50th St., New York, N. Y. Sinclair Refining Co., 600 Fifth Ave., New Sinclair Refining Co., and Film St., Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, III.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y. White & Bagley Co., Worcester, Mass.

COMPOUNDS, Resin and Molding

General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Blanchard Mch. Co., 64 State St., Cambridge, Angeles 58, Cai.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus. Die-Tool Mch. Co., 955 Cleveland.
Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden Ave.,
Syracuse, N. Y.
Eisler Engra. Co., 760 S. 13th, Newark 3, N. J.
Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.
Fellows Gear Shaper Co., Springfield, Vt.
Hartford Special Machry. Co., 287 Homestead.
Ave., Hartford Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland,
Ohio.
Lees-Bradner Co., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford,
Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland,
Ohio.
Rivett, Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St.,
Rockford, Ill.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Sheftield Corp., 721 Springfield St., Dayton 1, Ohio. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J. Verson Allsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, III. Wicaco Mch. Corp., Wayne Junction, Philadel-phia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee. Clark Controller Co., Cleveland, Ohio. General Electric Co., Schenectady 5, N. Y.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, III.

COOLANT SEPARATORS

See Separators, Oil or Coolant

COOLANT SYSTEMS

Gray-Mills Co., 1948-52 Ridge Ave., Evanston,

COUNTERBORES

COUNTERBORES

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-C Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.

(Continued on page 272)



Cold drawn Shelby Seamless Tubes provide high strength, low weight outrigger struts for B-47 Stratojet



The landing gear of the 100-ton B-47 Stratojet consists of dual main wheels in tandem with single outriggers attached to the inboard engine pods. The outer cylinder of each of the outrigger struts is fabricated from cold drawn USS Shelby

Mechanical Tubing.

Shelby Seamless is extremely strong and shock absorbent in proportion to its weight. Thus, it is ideal for incorporation into landing gears, engine mounts, longerons, wing spars, fuselage struts, and tail assemblies. Moreover, with Shelby Seamless Tubing, the basic shape for myriad aircraft parts is already made—and each section of tubing is as sound as the solid steel forging from which it is pierced. Thoroughly uniform and dimensionally accurate, Shelby Seamless Tubing is easy to bend, shape, machine and

Shelby Seamless is produced to exacting aircraft standards, in a wide range of diameters, wall thicknesses and steel analyses. For fur-ther information or for help in applying Shelby Seamless Mechan-ical Tubing to your design speci-fications, write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

DEGOOG-

"WALLS WITHOUT WELDS,"

the vivid story of the manufacof National Seamless Pipe and Tubes is available free of charge for showing to industrial groups, clubs, school groups, etc. This educational sound film in brilliant technicolor contains some of the most dramatic steel mill operations ever recorded. Write for information.



NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA. (Tubing Specialties)

> COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS UNITED STATES STEEL EXPORT COMPANY, NEW YORK



MLESS MECHANICAL TUB





DISCS with legends, behind flat lenses, deliver specific messages.

our engineering department.

tures provide adaptability. If you have an unusual problem, consult



INDICATOR MEHT

accommodate a wide range of Incandescent and Neon Glow Lamps. For neon, DIALCO offers an exclusive feature - BUILT-IN RESISTORS (U. S. Patent No. 2,421,321) for operation on 105-125 V, or 210-250 V. Simple external resistors are provided for all higher voltages. EVERY ASSEMBLY IS AVAILABLE COMPLETE WITH LAMP. For design purposes we will send :

SAMPLES ON REQUEST - AT ONCE - NO CHARGE

CATALOG "L-200" gives you complete specs on DIALCO'S Oil-Tight Indicator Lights. Also available—a file of Special Catalogs on DIALCO Pilot Lights covering every indication requirement.

FREE — Brochure on "Selection and Application of Pilot Lights".



DIALIGHT CORP., 56 Stewart Ave., Brooklyn 37, N.Y. Please send Cat. "L-200" on Oil-Tight Lights

"Selection" Brochure. Pilot Light Catalogs.

CORPORATIO 56 STEWART AVENUE BROOKLYN 37, N. Y.

HYACINTH 7-7600

Company_ Address_

Product Directory

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York. Kennametal, Inc., Latrobe, Pa. National Twist Drill & Tool Co., Rochester, National Twist Drill & Tool Co., Rochester, Mich. Pratt & Whitney, West Hartford 1, Conn. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, Ill. Starrett, The L. S., Co., Athol, Mass. Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Starrett, The sec. 21650 Hoover No., Wich.
Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besty-weites Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Circular Tool Co., Inc., 765 Allens Ave., Providence S. R. I.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cel-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass. Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Jarvis Corp., Middletown, Conn.
National Twist Drill & Tool Co., Rochester, Mich. Mich. Scully-Jones & Co., 1903 Rockwell St., Chi-cago 8, III. Super Tool Co., 21650 Hoover Rd., Detroit 13, Super Tool Co., 21050 ... Mich. Union Twist Drill Co., Athol, Mass. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I. Millers Falls Co., Greenfield, Mass. Starrett, The L. S., Co., Athol, Mass.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass.

COUPLINGS, Flexible

Boston Gear Works 3200 Main St., North Quincy, Mass. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn. Philadelphia Gear Works, Erie Ave., and G St., Philadelphia Gear Works, Erie Ave., and G St., Philadelphia Gear & Pump Co., Inc., 9248 Hud-son Blvd., North Bergen, N. J.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Sier-Bath & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J. Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc. (Continued on page 274)



OUTSTANDING!



Never Before Such Versatility and Accuracy Available in its Price Range!

K. R. WILSON'S NEW FOUR COLUMN DOWN-ACTING HYDRAULIC PRESSES

Here's the Guided Platen Press that's setting new standards in efficiency, low cost metal forming and drawing, plastics and rubber molding, laminating, die cutting, assembling, die tryout, pressing and many other applications that require precise control of an accurately guided platen. Here are the details:

A standard line of 25-200 tons capacity four column presses built to accuracy heretofore obtainable only from costly custom-built presses. Platens are align-bored to optically controlled tolerances.

Operational Features: variable pressure • adjustable stroke • adjustable daylight • wide range of speeds • fast traverse with slow pressing • variable speed • manual, semi-automatic and full automatic controls.

Design Features:

- PLATENS ARE ALIGN-BORED for greater accuracy.
- EXTRA-LONG PLATEN GUIDES have renewable bronze bushings and lubricating fittings.
- POLISHED AND GROUND COLUMNS resist wear and increase accuracy of platen travel.
- MAXIMUM STROKE SAFETY LIMIT CONTROL prevents damage to dies or press due to over-travel of platen.
- COMPACT, SELF-CONTAINED PUMPING UNITS insure dependable, trouble-free service.
- CUSTOM ACCURACY, custom quality at standard line prices. Get full details and complete specifications. Write for Bulletin No. 95.

HYDRAULICS DIVISION ARCADE, NEW YORK, U.S.A.



CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich. Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Gleason Works, 1000 University Ave., Rochester 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving). National Twist Drill & Tl. Co., Rochester, Mich. Pratt & Whitney, West Hartford 1, Conn. Union Twist Drill Co., Athol, Mass. Waltham Mch. Works, Newton St., Waltham, Mass. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich. Fellows Gear Shaper Co., 78 River St., Spring-

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
du Mont Corp., Greenfield, Mass.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Threadwell Tap & Die Co., Greenfield, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

CUTTERS, Milling

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Barber-Colman Co., Rock St., Rockford, Ill.

Brown & Sharpe Mfg. Co., Providence, R. I.

Carboloy Dept., General Electric Co., Box 237,

Roosevelt Park Annex, Detroit 32, Mich.

Cleveland Twist Drill Co., 1242 E. 49th St.,

Cleveland, Ohio.

DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Gorton, George, Mch. Co., 1110 W. 13th St.,

Racine, Wis.

Hoynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

Ingersoil Milling Mch. Co., 2442 Douglas St.,

Rockford, Ill.

Kearney & Trecker Corp., Milwaukee, Wis.

Kennametal, Inc., Latrobe, Pa.

Motch & Merryweather Mchy Co., Penton Bidg., Cleveland, Ohio.

National Twist Drill & Tl Co., Rochester, Mich.

Onsrud Machine Works, Inc., 3940 Palmer St.,

Chicago, Ill.

Pratt & Whitney, West Hartford 1, Conn.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

Super Tool Co., 21650 Hoover Rd., Detroit 13,

Mich.

Tomkins-Johnson Co., Jackson, Mich. Mich.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co. 1220 Woodward Heights Blvd,,
Ferndole, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burrs Rotary

CUTTING COMPOUNTS

See Compounds, Cut ng, grinding, Etc.

CUTTING AND GRINDING FLUIDS

Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cimcool Div., Cincinnati Milling Mch. Co.,
Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York,
N. Y. Ciries service oil Co., N. Y. DoAil Co., 254 N. Laurel Ave., Des Plaines, Ill. Ploughton, E. F., & Co., 303 W. Lehigh Ave., Philodelphia, Pa. Shell Oil Co., 50 W. 50th St., New York, N. Y. Sinclair Refining Co., 600 Fifth Ave., New York. York.
Standard Oil Co., (Indiana), Y10 3, 1....
Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St.,
Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

CUTTING-OFF MACHINES

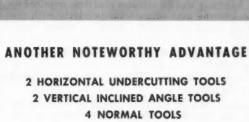
Bardons & Oliver, Inc., Ft. W. 9th St., Cleve-land 13, Ohio. Brown & Sharpe Mfg. Co., Providence, R. I. Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type). Consolidated Mch. Tool Co., Rochester, N. Y.

(Continued on page 276)

THE
LITTLE
GIANT
OF THE
PETERMANN
FAMILY



AUTOMATIC



8 Tools IN ALL . . . the special toolholders readily replaceable with standard holders or attachments.

JUST ONE MORE REASON WHY PETERMANN IS PREFERRED!



8 X 5171

For work within its copacity (pieces $\frac{6}{22}$ " in diameter and $\frac{1}{2}$ " long) we offer a machine of 'deadly' accuracy and high production . . . 10 speeds to 12,000 RPM.

BUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.



Magna-Lock Magnetic Chuck at Turchan Follower Machine Company

EDUCES SETUP TIME 66.6%

THE JOB: Milling hard cast iron gibs, 1%" maximum width, variable lengths, 60° compound angle, .250" taper per foot. Roughing cut: 1\%" max. width, 0.200" depth. Finishing cut: 1\%" max. width, 0.050" depth. Spindle speed: 385 RPM. Cutter: 8-flute carbide tip 3" dia. Table speed: 15 IPM-20 IPM. Stock removal: Approximately 4 cu. in. per min. Fixture: mechanical.

1. Fixture setup time and handling was 60 minutes plus time required to lay out, drill and tap holes in the gibs to coincide precisely with the bolts of the fixture. Spacing varied between 9" and 10" at several intermediate increments.

2. The holes were not functional parts of the gibs, being used only to hold the gibs while being milled.

3. Because of the several milling operations, the gib had to be removed each time and re-bolted to the fixture.

THE SOLUTION: A Hanchett MAGNA-LOCK Magnetic Rectangular CHUCK positioned on a sine bar, the milling machine cutter spindle being swiveled to the corresponding angles.

- 1. FIXTURE SETUP AND HANDLING TIME 20 MINUTES.
- 2. Lay out, drilling and tapping operations eliminated.
- 3. Time required to re-bolt gibs on fixture for each operation eliminated.

You, too, can increase your machines' productivity with Hanchett Magna-Lock Magnetic Chucks and Devices. Take advantage of Magna-Lock's experience and engineering know-how - at your service to help you solve your holding problems. Magna-Lock is the only exclusive manufacturer of magnetic chucks and devices. WRITE TODAY, M-16.

Request Magna-Lock as original equipment on your new machines.





CORPORATION

Magnetic Chucks and Devices BIG RAPIDS, MICHIGAN, U. S. A. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Landis Machine Co., Waynesboro, Pa., (Pipe). Lewis Machine Co., 3441 E. 76th St., Cleve-land 27, Ohio Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).

CUTTING-OFF MACHINES, **Abrasive Wheel**

Campbell Machine Div., American Chain & Cable, Bridgeport, Conn. Hamilton Div., The Lodge & Shipley Co., Hamilton I, Ohio. Wallace Tube Co., 1304-08 Diversey Pkwy., Chicago, III.

CUTTING-OFF MACHINES, Cold Saw

See Sewing Machines, Circular

CUTTING-OFF MACHINES, **Metal Band Saws**

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III. DoAll Co., 254 N. Laurel Ave., Des Plaines, III.

CUTTING-OFF TOOLS

CUTTING-OFF TOOLS

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland T4, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., PittsDurgh 30, Pa.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo.

CUTTING-OFF WHEELS, Abrasive

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worce ter, Mass.
Simonds Abrasive Co., Tacony & Fraley Sts.,
Philadelphia 37, Pa.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

CYLINDER BORING MACHINES
Baker Bros., Inc., Sta. F, Box 101, Toledo
10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Ingersoll Milling Mch. Co., 2424 Douglas St.,
Rockford, Ill.
Michigan Drill Head Co., Detroit 34, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.

CYLINDERS, Air

Hannifin Corp., 501 Wolf Rd., Des Plaines, Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. 35, Mass. Tomkins-Johnson Co., Jackson, Mich.

CYLINDERS, Hydraulic

Barnes, John S., Corp., Rockford, III. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio Logansport Machine Co. Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordnance Co., Irvine, Warren County, Pa.
Oligear Co., 1569 W. Pierce St., Milwaukee, Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass. Rivett Latne a Gilliae, 100, 2500 Kiswaukee 31, Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, III. Tomkins-Johnson Co., Jackson, Mich. Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DEALERS, Machinery

Falk Machinery Co., 18 Ward St., Rochester, N. Y. N. Y.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. (Continued on page 278)

For Self-tapping Screws that...

Start Right

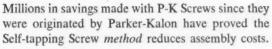


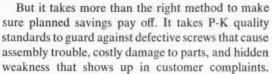
Drive Right



Seat Right



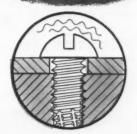




Only Parker-Kalon can offer P-K quality, the indispensable extra, along with the proved advantages of Self-tapping Screws.

Plan your assemblies for lowest cost . . . a P-K







Assembly Engineer will help you. Then make sure planned savings keep on paying off . . . when you purchase, order "P-K". Parker-Kalon Division, General American Transportation Corporation, Clifton, New Jersey.

PARKER-KALON

The First SELF-TAPPING SCREWS

originated by P-K . . . and first today . . . the leading choice for fastening economy



Remember P-K means OK

The WIEDEMANN METHOD Cuts Piercing Costs 60 to 90%

Because ONLY a WIEDEMANN combines:



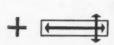
A Punch Press

(PIERCING SPEED)



Punches and Dies in Turrets

(NO SETUP)



Work Locating Gauge

(NO LAYOUT)



Capacities from 7-1/2 to 150 Tons Throat depths from 12" to 60"

- · INCREASED PRODUCTION
 - REDUCED COST
 - o MAXIMUM FLEXIBILITY

Get the facts—send drawings of your work for a free time study or write for Bulletin 101.

WIEDEMANN MACHINE COMPANY

4205 Wissahickon Ave. P.O. Box 4205, Philadelphia 32, Pa.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass. Heald Mch. Co., 10 New Bond St., Worcester 6, Mass. Co., Hess Ave., Saginaw, Mich. Taft-Peirce Mfg. Co., Woonsocket, R. I. Walker, O. S. Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

DESIGNERS, Machine and Tool
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Hartford Specialty Mchry. Co., 287 Homestead
Ave., Hartford, Conn.
Michigan Drill Head Co., Detroit 34, Mich.
Milholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.,
Modern Ind. Engrg. Co. 14230 Birwood Ave.,
Detroit 4, Mich.
Pratt & Whitney, West Hartford, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio. Ohio. Spring Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mach. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Precision Diamond Tool Co., 102 South Grove Ave., Elgin, III. Smit, J. K., & Sons, Inc., Murray Hill, N. J.

DIE-CASTING

See Castings, Die

DIE-CASTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. N. Y. Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.

DIE CUSHIONS

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc. 6499 W. 65th St. Chicago, III.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.
Verson Altsteel Press Co., 93rd St., and S. Kenwood Ave., Chicago, III.

DIE INSERTS, Carbide

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Carboloy Dept., General Electric Co., Box 237. Roosevelt Park Annex, Detroit 32, Mich. Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Kennamental Inc., Latrobe, Pa. Metal Carbides Corp., Youngstown, Ohio. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DIEMAKERS' SUPPLIES

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, III.
Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

DIEMAKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Cincinnati Milling Mach. Co., Oakley, Cincin-nati 9, Ohio. Kearney & Trecker Corp., Milwaukee, Wis. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

DIE SETS, Standard

DIE SETS, Standard
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton,
Ohio.
Danly Mch. Specialties, Inc., 2107 S. 52nd
Ave, Chicago 50, III.
Pratt & Whitney, West Hartford I, Conn.
Producto Mch. Co., 990 Housatonic Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 225 N. 18th St., Ampere,
N. J. U. S. Tool Co., Inc., 225 N. 18th St., Ampere, N. J.
Wales-Strippet Corp., North Tonawanda, N. Y.

(Continued on page 280)



Pratt & Whitney's 3-57 Turbojet: The most powerful aircraft production engine in the world is rated in the 10,000-pound thrust class.

Why Pratt & Whitney Uses 19 Gear Grind Machines to Guarantee Performance in the World's Most Powerful Aircraft Production Engine

At Pratt & Whitney Aircraft, where finest quality gears and high production are essential to the manufacture of the J-57 Turbojet, 19 new automatic Gear Grind Machines are in daily use. Here is what Pratt & Whitney has to say:

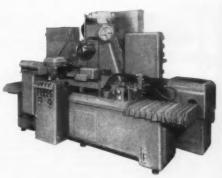
"The new Gear Grind Machines presently used in the aircraft engine division are the first major development in this type of machine since their use at Pratt & Whitney. They were developed in cooperation with Pratt & Whitney engineers to meet the specific and exacting requirements of modern aircraft engine gears. These machines are equipped with a new wheeltrimming feature and a two-speed spindle drive to eliminate burning.

"Another advantage is the relative ease with which the involute profile can be modified."

YOU'LL WANT TO KNOW MORE ABOUT THESE ADDITIONAL ADVANTAGES FOUND IN THE NEW GEAR GRIND AUTOMATICS

- Controlled flow of coolant through the grinding wheel insures non-tempered, case-hardened gears.
- Single or double diamond trimmers are used to assure a perfect blend between the tooth profile and the root fillet.
- Automatic trimming of the grinding wheel assures uniformly accurate work.
- Available as fully automatic machines incorporating automatic loading and unloading.

Write today for comprehensive eight-page brochure which explains the details.



For gears up to 36" diameter.

The Gear Grinding Machine Company

3921 Christopher, Detroit 11, Mich.

Manufacturers of:

The Detroit Screwmatic 750, Automatic Screw Machines. RZEPPA ("Sheppa") Constant Velocity Universal Joints

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-279







High compressive strength . . Low coefficient of expansion. 16 standard sizes, 6" thick — other sizes to order. Also available for sectional assembly into unlimited sizes.



Cast-Iron Top Work Benches

Four sizes, three styles. For individual use or on a continuous line. With selfcontained storage facilities.

Other Challenge Precision Products:
Clamp Edge Leyout Plates * Reading
Tables * Lapping Plates * Welding
Tables * Surface Plates * Bench Plates
* Surface Plate Equipment.

See the full line of Challenge Clovis Black Granite and Semi-Steel Surface Plates in the new Challenge Catalog. Send for your free copy today!



DIE-SINKING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St.,
Racine, Ms.
Orlan, Surf. Co., Inc., 34 Exchange Pl., Jersey
Tratt & Whitney, West Hartford 1, Conn.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.

DIE-SINKING PRESSES

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa. Kearney & Trecker Corp., Milwaukee, Wis. Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, III.

DIE STOCKS

See Stocks, Die

DIES, Sheet Metal, Etc.

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Ohio.
Carboloy Dept. General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich. Chambersburg Engrg. Co., Chambersburg, Pa. Columbus Die-Tool & Mach Co., 955 Cleveland Ave., Columbus, Ohio. Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, III. Ferracute Mch. Co., Bridgeton, N. J. Metal Carbides Corp., Youngstown, Ohio. Niagara Mch. & Tool Wks., 683 Northland Ave., Buffalo, N. Y. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio. Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Yerson Allsteel Press Co., 93d St., and S. Kenwood Ave., Chicago, III.
Wales-Strippet Corp., North Tonawanda, N. Y.
Waltham Mch. Wks., Newton St., Waltham,
Moss.
Winzeler Mfg. & Tool Co., 1712 W. Arcade Pl.,
Chicago 12, III.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Card, S. W., Mfg., Mansfield, Mass. Eastern Mch. Screw Corp., New Haven, Conn. Geometric Tool Co., Westville Station, New Haven 15, Conn. Greenfield Tap & Die Corp., Greenfield, Mass. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.,
Reed Rolled Thread Die Co., P.O. Box 350,
Worcester 1, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Threadwell Tap & Die Co., Greenfield, Mass.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn. Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y. Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield Vt. Landis Mch. Co., Waynesboro, Pa. National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

DIES, Thread Rolling

Pratt & Whitney, West Hartford 1, Conn. Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass. Sheffield Corp., 721 Springfield St., Dayton 1,

DISCS, AbrasivesBesly-Welles Corp., 112 Dearborn Ave., Beloit, Carborundum Co., Buffalo Ave., Niagara Falls,

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Macklin Co., 2925 Wildwood Ave., Jackson, Mich. Norton Co., 1 New Bond St., Worcester, Mass. Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa. Smit, J. K. & Sons, Inc., Murray Hill, N. J. Thor Power Tool Co., Aurora, Illinois Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

DISINTEGRATORS

Elox Corp., 602 N. Rochester Rd., Clawson, Mich.

DIVIDING HEADS

See Indexing and Spacing Equipment

DOWEL PINS

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Danly Mch. Specialties, Inc., 2107 S. 52nd
Ave., Chicago 50, III.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Producto Machine Co., 990 Housatonic Ave.,
Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

DRESSERS, Grinding Wheel
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200. Oakman Blvd., Detroit
32, Mich.
Metal Carbides Corp., Youngstown, Ohio.
Moore Special Tool Co., Inc., 724 Union Ave.,
Bridgeport, Con.,
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio. Ohio. uper Tool Co., 21650 Hoover Rd., Detroit 13,

DRIFTS, DRILL

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St., Cieveland 14, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth, Rd., Plymouth, Mich.

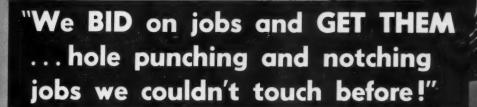
DRILL HEADS, Multiple Spindle

Baker Bross, Inc., Station F, P.O. Box 101, Toledo 10, Ohio. Barnes Drill Co., 814 Chestnut, Rockford, III, Buffalo Forge Co., Broadway, Buffalo, N. Y. Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cincinnati Lathe & Tool Co., 3207-3211 Disney
St., Cincinnati P., Ohio.
Errington Mechanical Laboratory, 24 Norwood
Ave., Stapleton, S. I., N. Y.
Etco Tool Co., Inc., 592 Johnson Ave., BroakIyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit,
Mich.
Govro-Nelson Co., 1933 Antoinette St., Detroit
8. Mich. Ex-Cell-O Corp., 1200 Oakman Blva, Detroit, Mich.
Govro-Nelson Co., 1933 Antoinette St., Detroit 8, Mich.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Jarvis Corp., Middletown, Conn.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 Lafayette,
Detroit 7, Mich.
Thiffmaster Products Corp., 1076 N. Plum St.,
Lancaster, Pa.
United States Drill Head Co., 616 Burns,
Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakewood Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, III.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Michigan Drill Head Co., Detroit 34, Mich.
Milholland, W. K. Machinery Co., 6402 Westfield Blyd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-H Harriet
St., Cincinnatl 3, Ohio.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee
St., Rockford, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III. (Continued on page 282)



... thanks to our new

WALES FABRICATOR

"Sure, we bid on most every job that comes along. Got a good modern sheet metal department and experienced men too, but we used to miss a lot of good contract stuff. Couldn't understand where or why our bids were off. "Trouble was, our estimators, all top men, figured jobs on a past performance basis. Ways and methods used successfully for years.

"We found the answer. WALES FABRICATORS for our punching and notching . . . yes, and nibbling too. 165 strokes a minute! Shaped and round holes are quick to set up and easy to change.

"Set up time is just about one quarter the time it used to take us. Graduated sets of punch assemblies are right at the man's hand. They switch over with little downtime and our production rolls ahead. No templets are needed with this equipment... think of it! Work right from prints or operation sheets.

"NOW, we get our share of those bid jobs. We make money on them too, even against mighty sharp competition.

"It was a good day when WALES Engineers came in and gave us the answer. They proved it too! The only tough competition for us is another shop with WALES equipment." (It's difficult to beat the 'WALES-WAY'!)

New EASY PAYMENT PLAN

Small down payment and your EXTRA PROFITS will handle the balance in convenient monthly payments. Take several years to pay if you wish.

Send for BULLETIN NO. 15

Pictures and descriptions that will give you a better idea of the additional work you can handle with the WALES FABRICATOR.

We'll DEMONSTRATE at your door!



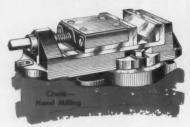
Our Mobile Truck Unit will be available to bring the WALES FABRICATOR and other WALES equipment to your door. See it in action. Test its speed and accuracy for yourself. No obligation.



WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONT.

precision machine

VISES







quick action! positive grip!

Skinner precision milling mathine and drill press vises are unequalled in their fast, positive gripping action. They are available in several different models, with either plain or swivel base, to handle all types of milling, drilling, tapping, etc.

Write Skinner or your nearest Skinner distributor for General Catalog.



CHUCK COMPANY

206 Edgewood Avenue, New Britain, Conn

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Besly-Welles Corp., 112 Dearborn Ave., Beloit,

Wis. Cleveland Twist Drill Co., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. National Twist Drill & Tool Co., Rochester,

Mich. Whitney, West Hartford I, Conn. Scully-Jones & Co., 1903 Rockwell St., Chicago B, III.
8, III.
9, III.
Whitney, West Hartford I, Conn. Hartford I, Conn. Hartford III.
9, III.
10, III.
11, III.
11, III.
12, III.
13, III.
14, III.
15, III.
16, III.
16, III.
17, III.
18, III.
18, III.
18, III.
19, III.
19

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio. Greenfield Tap & Die Corp., Greenfield, Mass. National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati 4, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLING MACHINES, Automotic

DRILLING MACHINES, Automotic
Avey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Bausch Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich. Bodine Cotp., Mr. Grove 7r, Bridgeport, Cohn., Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y. Cross Co., 3250 Bellevue, Detroit 7, Mich. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H. Michigan Drill Head Co., Detroit 34, Mich. Milholland, W. K. Machinery Co., 6402 Westfield Bivd., Indianapolis 5, Ind. Morris Machine Tool Co., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Wales-Stripper Corp., North Tonawanda, N. Y. Zagar Tool, Inc., 24000 Lakeland Bivd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Mch. Co., 126 E. Third St.,
Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Cincinnati Lathe & Tool Co., 3207-3211 Disney
St., Cincinnati 9, Ohio.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 S. 9th St., Hamilton,
Ohio. Hamilton Tool Co., 303 Southbridge St., Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
St., South Bend, Ind.
Stondard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio. Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

Avey Drilling Mach. Co., 26 E. Third St., Cov-Co., 1025 Southbridge St., Leland-Gifford Co., 1025 Southbridge \$1., Worcester, Mass. Michigan Drill Head Co., Detroit 34, Mich. National Automatic Tool Co., Inc., 5. 7th and N. St., Richmond, Ind. Prott & Whitney, West Hartford 1, Conn. Wales-Strippet Corp., North Tanawanda, N. Y.

DRILLING MACHINES, Gang

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Boker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio,
Barnes Drill Co., 814 Chestnut, Rockford, III.

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis. Consolidated Mch. Tool Corp., Rochester, N. Y. Edlund Machinery Co., Cortland, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland. Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Michigan Driil Head Co., Detroit 34, Mich. Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Horiz.

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St.,
Rockford, Ill.
Bausch Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich. Springfield 7, Mass.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Consolidated Mch., Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machiner Co., 121 East Luray St., Philadelphia 20, Pa.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kingsbury Mch. Tool Corp., Keene, N. H.
Michigan Drill Head Co., Detroit 34, Mich.
Milholland, W. K. Machinery Co., 6402 Westfield Blwd, Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Snow Mfg, Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg, Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio.

DRILLING MACHINES, Inverted

DRILLING MACHINES, Inverted
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Bausch Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Notional Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

Ayey Drilling Mch., Co., 26 E. Third St., Cov-Ayey Drilling Mch., Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor,
Mich.
Cross Co., 3250 Bellevue, Detroit 7, Mich.
Michigan Drill Head Co., Detroit 34, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., 5. 7th and
N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle DRILLING MACHINES, Multiple Spindle
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F. P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, Ill.
Bausch Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.

(Continued on page 284)

Talking About Die Sets



WITH
PHIL MARSILIUS
Vice-President
The Producto Machine Co.

Proper Care of Die Sets—How can you be sure your die set will be as accurate the day you tool it as it was when the manufacturer assembled it? While he guarantees the set he has shipped to you, the manufacturer has no control over the treatment it receives after it leaves his plant.

Unusually rough treatment or exposure to moisture—which can occur in transit, on your receiving dock, in your stockroom or in your toolroom—can easily destroy the die set's accuracy. Though these occurrences are rare, you should protect yourself against them by a prescribed routine.

When a die set reaches your receiving dock, inspect it immediately. If rust or misalignment has occurred and is not detected until the set is ready to be tooled, you may have serious production delays.

We recommend the following procedure: 1) Uncrate the die set; 2) Clean the set without disassembling; 3) Check it for parallelism; 4) Check it for free movement of punch holder; 5) Lubricate the pins and bushings; 6) Coat all critical surfaces with a light protective film of oil; 7) Store the set in a dry area on wooden blocks or pallets. You can then be sure that every die set is always ready for use.

If inspection shows something is wrong with the set, contact the manufacturer immediately for permission to return it for repair or have a replacement issued.

When production with the die has been completed, repetition of the above procedure will insure that the tooled die set will be ready for immediate use when needed again.

By these simple steps, you can preserve the degree of accuracy built into the die set.



Where mass production and consistent quality join hands: one of Producto's die set inspection stations.

HOW PRODUCTO MAINTAINS CONSISTENT DIE SET ACCURACY FOR YOU

Though mass production of die sets makes possible larger stocks and faster delivery, it may also be the cause of sub-standard quality. Only 100% inspection, as practiced by Producto, can consistently maintain the accuracy of mass-produced parts.

At Producto, every die set component—die bed, punch holder, guide pin, bushing—is checked first at the point of manufacture, then at a secondary inspection station, and finally, at the assembly station. Not only are parts checked with highly-accurate surface plates and gages against precision standards, but also visually for flaws that might mar appearance.

Whether you specify two Producto die sets or two hundred, you can be sure they will be *consistently* accurate to the highest standards of the die set industry.

If you're looking for valuable ideas on die sets and their application, write for our free quarterly, *Die Set Digest*. And if you're looking for precision die sets fast, remember to call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY

985 Housatonic Avenue, Bridgeport 1, Connecticut Telephone FOrest 7-8675

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta CY 7667	DetroitLI 6-7600	Philadelphia MO 4-1010
Chicago ES 8-3307	Kansas City BA 9033	Rochester
Cleveland SU 1-6158	Los Angeles TR 9826	St. Louis FR 1-3370
Dayton MU 1651	New York WO 4-7484	or check the Yellow Pages in

any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With

PRODUCTO

Precision Die Sets



Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Cincinnotti Bickford Tool Co., 3220 Forrer Ave., Cincinnotti Bickford Tool Co., 3220 Forrer Ave., Cincinnotti, Ohio.
Cincinnotti Latthe & Tool Co., 3207-3211 Disney St., Cincinnotti Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis. Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 2250 Bellevue Ave., Detroit 7, Mich. Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnotti 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Michigan Drill Head Co., Detroit 34, Mich.

Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14320 Birwood Ave.,
Detroit 4, Mich.,
Moline Tool Co., 102 20th St., Moline, Ill.,
Moline Tool Co., 102, Moline, Ill.,
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and
N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit, Mich.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio. Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366
Beekman St., Cincinnati 23, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Cosa Corp., 405 Lexington Ave., New York A. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Postick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill. Cincinnati Bickford Tool Co., 3220 Forrer Ave.,

DRILLING MACHINES, Rail

See Drilling Machines, Gang

DRILLING MACHINES, Sensitive

DRILLING MACHINES, Sensitive

Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Cincinnati 9, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Edlund Mach.nery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio. Hamilton Tool Co., 834 S. Ytn St., Hamilton, Ohio.
Deland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mtg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Upright

DRILLING MACHINES, Upright
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, III.
Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.
Bausch Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo, Farge Co., 490 Broadway, Buffalo,
N.Y.
Cincinnati Bickford Tool Co., 3220 Farrer Ave. N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave.,
Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney
St., Cincinnati 9, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York Edlund Machinery Co., Cortland, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland Edlund Machinery Co., Cortland, N. Y. Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry Co., 287 Homestead Ave., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Moline Tool Co., 102 20th St., Moline, III.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Orbon Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, III.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.
Snyder Tool & Engrg, Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend, Ind.
Wales-Strippet Corp., North Tonawanda, N. Y.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works, 3817 St. Clair Ave., N.E., Cleveland, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y.

The Atrax Co. (Carbide) 240 Day St., Newington 11, Conn. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Chicago-Latrobe Twist Drill Works, 411 W Ontario St., Chicago, III.

(Continued on page 286)

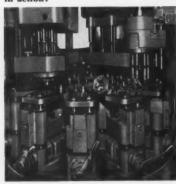
MILLHOLLAND

12-Station Vertical **Indexing Machine**

34 Spindles!

93 Pieces per Hour!

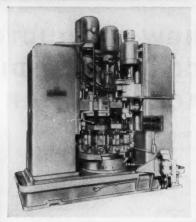
Here is Millholland versatility in action!



Unique Holding Fixture

With a 31-second cycle time, this machine produces 93 pieces per hour at 80% efficiency! This chip cutting efficiency is made possible by the distinctive design of the plate type cam used in Millholland Automatic Units, plus the action of the pneumatic counterbalance.

Two No. 5 Units are mounted vertically, the first with 22 spindles, the second with 5; a No. 2 unit is mounted horizontally on a rapid travel slide, and an Automatic



Lead Screw Tapper with reversing motor drives a 6-spindle tapping head. All ma-chine elements are electrically synchronized, with push-button control for "cycle start," automatic single cycle, set-up and emergency stop. Chip disposal is sim-plified with wiper blades rotating within a ring on the index table to bring chips to a removable pan.

Part requirements dictated location using self-centering horizontal vees with up-acting clamps, actuated by a single handle operating through a small arc. Fixtures also contain register pins for all bushing plates. The 12 fixtures are mounted on an independently powered automatic in-dex table with self-contained lubrication

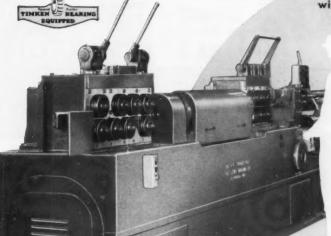
> A complex production problem, solved efficiently with Millholland equipment and Millholland know-how.

Write for Bulletin M-1 giving further details.

W. K. MILLHOLLAND MACHINERY CO. 6402 Westfield Blvd. Indianapolis 20, Indiana

LEWIS

Machines can solve any wire straightening or cutting problems



No. 11-F TRAVEL-CUT with special extension

This machine was engineered to meet special requirements for custom cutting a wide variety of concrete reinforcing bars up to 50 feet in length

SINGLE STATION OPERATION

eliminates waste time and fatigue by placing operator at one position

By the simple movement of a lever the operator can set the electric limit switch to cut any desired length from 6 to 50 feet. A dial graduated in feet and inches tells him the exact length the machine will cut. A preset counting device stops the machine when the proper number of pieces is cut.

Any predetermined number of pieces may be cut with this equipment to any predetermined length without the operator moving from his regular position at the machine.

There is a Lewis Machine design to straighten and cut all materials and shapes in wire and or bar stock from .012" to ¾" diameter at a wide range of speeds. If you have a wire straightening and cutting problem, or special requirements for a job, ask us for information and suggestions about how Lewis Machines can increase your production, control your quality and greatly reduce your costs.

New illustrated brochure available on request.

THE LEWIS

MACHINE COMPANY

3441 East 76th Street + Cleveland 27, Ohio, U.S.A.

Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich.

National swiss community Mich.

Union Twist Drill Co., Athol, Mass.

Union Twist Drill Co., Athol, Mass.

Whitman & Barnes, 40600 Plymouth Rd.,

Plymouth, Mich.

DRILL. Core

Ace Drill Corp., Adrian, Michigan. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontorio St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Havnes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.

National Association of the Asso Smit, J. K., u. 21650 Hoover Super Tool Co., 21650 Hoover Mich. Mass. Weson Co., 1220 Woodward Heights Blvd., Ferndole, Mich. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich. Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Ace Drill Corp., Adrian, Michigan. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Besly-Welles Corp., 112 Dearborn Ave., Deloin, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Portable Electric

DRILLS, Portable Electric
Chicago, Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass., Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati Ohio.
Thor Power Tool Co., Aurora, Illinois

DRILLS, Portable Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York 9, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill. Thor Power Tool Co., Aurora, Illinois

DRILLS, Rachet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Beyl-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Chicago-Littobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohic Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DRILLS, Subland

Ace Drill Corp., Adrian, Michigan. Mohawk Tools, Inc., 910 E. Main St., Mont-peller, Ohio. Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist

Ace Drill Corp., Adrian, Michigan.
The Afrax Co. (Carbide) 240 Day St., Newington 11, Corn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis. Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland 14, Ohio.
DoAll Co 254 N. Laurel Ave., Des Plaines, III.
Firth Ster ing Inc., 3113 Forbes St., Pittsburgh
30 Pa
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich. Mich.
Pratt & Whitney, West Hartford 1, Conn.
Super Tool Co., 21650 Hoover Rd., Detroit 13,

DRILLS, Wire

Ace Drill Corp., Adrian, Michigan.
The Atrax Co. (Carbide) 240 Day St., Newington 11, Conn.
Besty-Welles Corp., 112 Dearborn Ave., Beloit,
Wis. Wis.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester,
Mich. Mich.
Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

DUPLICATORS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis. Pratt & Whitney, West Hartfard 1, Conn. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III. Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DUST COLLECTORS

Pangborn Corp., Hagerstown, Md.

DUST CONTROL SYSTEMS

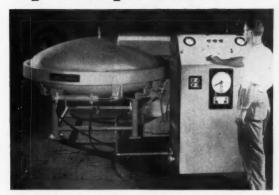
Pangborn Corp., Hagerstown, Md. (Continued on page 288)



PRECISION SPINDLES AND MACHINE TOOLS

2500 RIVER ROAD . CINCINNATI 4, . OHIO

Completely Automatic AUTOCLAVES by Philips & Davies



True "push-button" operation is featured in these new and unique Autoclaves by Philips & Davies, Inc.-with all cycles and operations COMPLETELY AUTOMATIC! Cycling and operation is controlled with pin-point accuracy, with an automatic timer, automatic heat control, automatic cycling control, automatic air control, automatic water control, and automatic steam controlplus automatic hydraulic opening, closing and locking of the unit.

One man and a helper can operate a bank of up to EIGHT Autoclaves. Savings in time and labor over the old manual control methods are tremendous-besides giving better finished work due to rigid control in every step of the operating procedure. In any industry where HEAT UNDER PRESSURE IS REQUIRED TO PROCESS MATERIAL, the Philips and Davies completely automatic

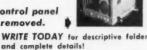
Autoclave will COMPLETELY REVOLU-TIONIZE your procedures-give you enormous savings, faster processing; better quality and more accurate work!

> Close up of front of control panel.

THE AUTOCLAVE'S "MAGIC BRAIN" is in this unique control

mechanism. Its push-button operation maintains constant pre-set temperatures during all of the cycles, and it records a written record of each complete cycle. Once the operator starts the cycle by pushing load button-operation is completely automatic! It's the last word in precision automatic control!

> Interior of control panel with covers removed.



MACHINERY SINCE 1877



PHILIPS & DAVIES, INC. Kenton, Ohio

QUALITY HEAVY

production begins with

Columbus Die-

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more than 46 years of designing and engineering experience go to work for you, Contact CDT today about your special die, tool and machinery requirements.

Polumbus Die-Tool AND MACHINE COMPANY

P. O. BOX 750 . COLUMBUS, OHIO ESTABLISHED 1906

Manufacturers of

. FIXTURES . BUILDING MACHINE TOOLS COMPLETE

SPECIAL TOOLS . UNITS FOR MACHINE TOOLS

Before you hang up,



All seven of our modern warehouses are located in principal industrial areas...near you. Each one is wellstocked: equipped to fill your alloy steel requirements promptly, whether you need standard AISI, SAE or our own special HY-TEN steels-"the standard steels of tomorrow". Every warehouse, too, is staffed with experts in metallurgy who are ready to serve you.

Write today for your FREE copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

near you ...

Warehouse Service - Cambridge . Cleveland . Chicago Hillside, N. J. . Detroit . Buffalo . Cincinnati

In Canada-Sanderson-Newbould, Ltd., Montreal and Toronto



WHEELOCK, LOVEJOY & COMPANY, INC.

138 Sidney Street, Cambridge 39, Massachusetts

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel

EMERY WHEELS

See Grinding Wheels

END MILLS

The Atrax Co. (Carbide) 240 Day St., Newing-ton 11. Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wish, Welles Corp., 112 Dearborn Ave., Penton
Bidg., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester,
Mich.

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Gorton, Geo., Mch., 1110 W. 13th St., Racine, Wis.

EXTRACTORS, Screw

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.

FACING MACHINES

Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Michigan Drill Head Co., Detroit 34, Mich. National Automatic To-i Co., Inc., S. 7th and N. Sts., Richmond, Ind.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co., 490 Broadway, Buffalo, General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic

Federal Machine & Welder Co., Overland Ave., Warren, Ohio. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

FELT, For All Applications

American Felt Co., Glenville, Conn.

FILES, Hack

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Heller Tool Co., Newcomerstown, Ohio. Nicholson File Co., 23 Acorn St., Providence, R. I. Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.

FILES. Machine

DoAll Co., 254 Laurel Ave., Des Plaines, III. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

The Atrax Co. (Carbide) 240 Day St., Newing-ton 11, Conn.

Mohawk Tools, Inc., 910 E. Main St., Mont-pelier, Ohio.

DoAli Co., 254 N. Laurel Ave., Des Plaines, Ill.

Jarvis Corp., Middletown, Conn.

Pratt & Whitney, West Hartford 1, Conn.

Wesson Co., 1220 Woodward Heights Blvd.,

Ferndale, Mich.

FILING MACHINES, Dies, Etc.

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Coolant and Oil

Barnes Drill Co., 814 Chestnut St., Rockford, Cuno Ei gineering Corp., Meriden, Conn. Industrial Filtration Co. (Delpark Corp.) 15 Industrial Ave., Lebanon, Ind. (Continued on page 290)

HELLER

american-Swiss ROUND HANDLE



NEEDLE FILES

NEW

a complete
set in this
compact
carrying case

FIRM GRIP HANDLE

For die makers and other tine tool makers. Twelve different shapes, each with long knurled handle for firm grip. All are double cut.

SIZE	CUT	WT.
4"#	0, 2, 4, 6	0-2
51/2"	0, 2, 4, 6	0-5
614"	0, 2, 4, 6	0-8

In 4" length, Oval is furnished instead of Crossing,



Also made in Square Handle Needle (Escapement) 5 1/2" size only—cuts 0-2-4-6



VIXEN American-Swiss NUCUT

FAMOUS BRANDS MADE BY

HELLER TOOL CO.

Subsidiary of Simonds Saw and Steel Co.

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

BRANCH OFFICES . . . New York . Chicago . Detroit . Los Angeles

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-289

FINISHES FOR MACHINE AND METAL

Lowe Bros. Co., Dayton, Ohio.

FLEXIBLE COUPLINGS

See Couplings, Flexible

FLEXIBLE SHAFT EQUIPMENT

Jarvis Corp., Middletown, Conn. Pratt & Whitney, West Hartford 1, Conn.

FORGINGS, Machines (Upsetting)

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio. Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Hill Acme Co., 1201 W. 65th St., Cleveland 2, National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa. Mueller Brass Co., Port Huron 35, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORGINGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Upset

Bethlehem Steel Ca., Bethlehem, Pa. Mueller Brass Co., Port Huron 35, Mich. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

FORMING AND BENDING MACHINES

FORMING AND BENDING MACHINES

American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N.E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,
Chicago 36, Ill.
Erie Foundry Co., Erie, Pa.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.

Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,

HII.
Hydraulic Press Mfg. Co.. Mount Gilead, Ohio Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Wallace Supplies Mfg. Co., 1304-08 Diversey Pkwy., Chicago, III.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

FORMING AND STAMPING MACHINES

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Gerrard Aves.,
Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd.,
Chicago 36, Ill.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Nigagra Mch. & Teal Works 482 Northing

N. Y.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Verson Allsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, Ill.

FORMING TOOLS or Tool Blanks

FUKMING TOULS or Tool Blanks
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Po.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.

FRAMES, Machinery Welded

Federal Machine & Welder Co., Overland Ave., Warren, Ohio. Mahon, R. C. Co., Detroit 34, Mich. Verson Allsteel Press Co., 93rd St., & S. Ken-wood Ave., Chicago, Ill.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc. 200 Lafayette St.,
New York 12, N. Y.
Taft-Peirce Mfg. Co. Woonsocket, R. I.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Tatt-Peirce Mfg. Co., Woonsocket, R. I.
(Continued on page 292)

BOOBBORD



EASY ADJUSTMEN

COMPACT DESIGN HIGH TORQUE

HIGH-RATIO LEVERS

PRECISION BUILT

LONG WEAR LIFE

of ROCKFORD Multiple-Disc CLUTCHES is simple, easy and ample to maintain uniform operating conditions under long, hard usage, Unaffected by centrifugal force, PULLMORE clutches are convenient to operate and are positive in driving, braking and EASY ADJUSTMENT : newtral action.

*One-point adjustment, by hand, Sond for This Handy Bulletin

Shows typical installations of ROCKFORD installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams





ROCKFORD CLUTCH DIVISION WARNIE A 410 Catherine Street, Rockford, Illinois, U.S.A. A

000000

THE



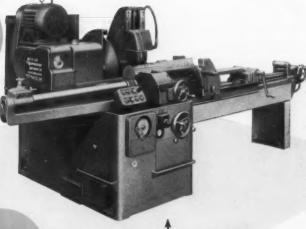
15 A Triple-threat

TO HIGH CUTTING COSTS

CIRCULAR SAWING MACHINES

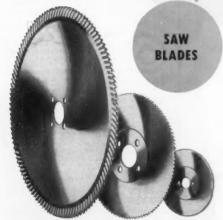


SAW BLADE SHARPENERS



The No. 2-8 machine for cutting off solid metal up to 8" square.

The G-45 sharpener for blades 8" through 48" diameter.



M. & M. saw blades cut any machinable metal. Cut-off blades: segmental — 11" through 120" diameter; solid — 8" through 20" diameter. Slitting saws — 3" through 8" diameter. You may profit immensely by applying the M. & M. Triple Threat to your cut-off costs. Machine, blade, and grinder, made by the first company to build all 3, often effect phenomenal savings, as proved by detailed case studies. Just such a study of your job is yours for the asking. We offer you an unmatched experience in the sawing of any machinable metal, round, square or structural shapes, from 1/4" through 43" diameter.

THE MOTCH & MERRYWEATHER MACHINERY Co.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders also of Production Milling, Vertical Turning, Automatic and Special Machines

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-291

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass. Cleveland Instrument Co., 735 Carnegie Ave., Cleveland Instrument Co., 735 Carnegle Ave., Cleveland Is, Ohio.
Comfor Co., 47 Farwell St., Waltham 54, Mass. Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P.O. Box 1027, Providence, R. I.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III.

Federal Products Corp., P.O. Box 1027, Provirederal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N.Y.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio. Ohio.
Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 Laurel Ave., Des Plaines, III. Federal Products Corp., P.O. Box 1027, Provi-Federal Products Corp., P.O. Box 1927, Providence, R. 1.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

GAUSS, Electric
Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

GAGES, Height

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.

Brown & Sharpe Mfg. Co., Providence, R. I.

Cleveland Instrument Co., 735 Carnegie Ave.,

Cleveland 15, Ohio.

DoAII Co., 254 Laurel Ave., Des Plaines, III.

Lufkin Rule Co., Hess Ave., Saginaw, Mich.

Pratt & Whitney, West Hartford 1, Conn.

Scherr, George, Co., Inc., 200 Lafayette St.,

New York 12, N. Y.

Sheffield Corp., 721 Springfield St., Dayton 1,

Ohio. Ohio. Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

GAGES, Plug, Ring and Snap
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237,
Roosevelf Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Elgin National Watch Co., Aurora, III.
Elgin National Watch Co., Aurora, III.
Elgin National Watch Co., Aurora, III.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Praft & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y. Sheffield Corp., 721 Springrield St., Dayron 1, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.
Winter Bros. Co., Rochester, Mich.

GAGES, Surface

GASES, Surface
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland
Ave., Columbus, Ohio.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield St., Dayton 17,
Ohio. Ohio. Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.
Storrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

GAGES, Thread
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.
DoAli Co., 254 Laurel Ave., Des Plaines, III.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio. Onio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Winter Bros. Co., Rochester, Mich.

GASKETS

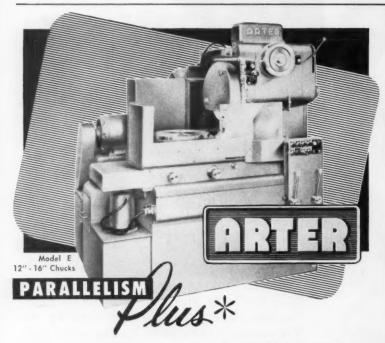
Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. General Electric Co., Schenectady 5, N. Y.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. (Continued on page 294)



* MANUAL and AUTOMATIC controlled hydraulic operation to work table. Can be arranged for complete automatic cycle grind.

* TABLE MOUNTED Diamond Dresser with dial control.

* STEPLESS VARIABLE SPEEDS

to table and chuck rotation. Tiltable chuck.

* HAND and AUTOMATIC WHEEL FEED

with power retraction.

Model E Hydraulic Rotary Surface Grinder (12 and 16" Chucks) has taken an honored place in the Arter Family of Machines after attaining a record of performance to which we point with pride.

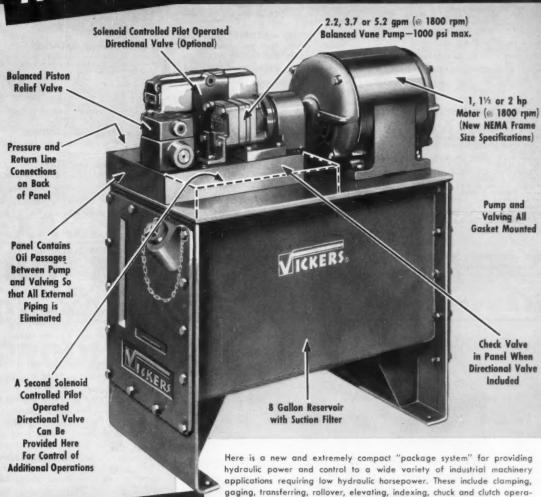
ARTER GRINDING MACHINE COMPANY

WORCESTER 5, MASSACHUSETTS

Jigmatic Automatic Tape Controlled Positioning Table • Rotary Surface Grinders Flat Circular Cutter Grinders • Internal Grinders • Cylindrical Grinders • Carbide Tool Grinders

AGENTS IN INDUSTRIAL CENTERS OF UNITED STATES AND CANADA

A NEW IDEA...in hydraulic power and control systems



VICKERS. Series TB HYDRAULIC PIPELESS POWER PACKAGÉ

7311

gaging, transferring, rollover, elevating, indexing, chuck and clutch operations, etc.

Note the many features indicated on the photograph above. The result is improved and simplified hydraulic design . . . also reduced installation and maintenance costs. This "package system" has great flexibility . . . is available in a wide variety of combinations of standard components assembled to suit individual requirements. Pretested and ready for immediate operation, it has also the advantage of undivided Vickers responsibility. For further information, ask for installation drawings 178706-8.

VICKERS INCORPORATED

1403 OAKMAN BLVD. . DETROIT 32, MICH.

Application Engineering Offices:

ATLANTA

CHICAGO

CINCINNATI
CLEVELAND

DETROIT

HOUSTON

LOS ANGELES AREA (El Segundo)
MINNEAPOLIS

NEW YORK AREA (Summil, N.J.)

PHILADELPHIA AREA (Modia)

PORTLAND, ORE.

ROCHESTER
ROCKFORD

SAN FRANCISCO AREA (Berkeley)

SEATILE

ST. LOUIS

TUSA
WASHINGTON

WORCESTER

IN CANADA: Vickers-Sperry of Cana da, Ltd., Terente

*These "package systems" supplement the Vickers line of standard hydraulic power units.

OF OIL HYDRAULIC EQUIPMENT SINCE 1921 ENGINEERS AND BUILDERS

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1,

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

BURRING MACHINES
Bilgram Gear & Mch Works, 1217-35 Spring
Garden St., Philadelphia, Pa.
Consolidated Mch Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N.;
Modern Industrial Engrg. Co., 14230 Birwood,
Detroit 4, Mich.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I. Eastman Kodak Co., Rochester, N. Y. Fellows Gear Shaper Co., 78 River St., Springfield, Vt., Gleason Works, 1000 University Ave., Rochester 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Notional Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsacket, R. I.

GEAR CUTTING MACHINES, Bevel

Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

ford, III.

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George Co., Inc., 200 Lafayette 5t., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Waltham Machine Works, Newton St., Wal-tham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing) Barber-Colman Co., Rock and Montague, Rock-

Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio,
Lees-Bradner Co., Cleveland, Ohio,
Lees-Bradner Co., Cleveland, Ohio,
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Scherr, George Co., Inc. 200 Lafayette St.,
New York 12, N. Y.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.

GEAR CUTTING MACHINES, Spur and

Helical Gears (Shaper or Planer Type)
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Triplex Machine Tool Corp., 75 West St., New York 6, N. Y.

GEAR CUTTING MACHINES, Worm and Worm Wheels

Barber-Colman Co., Rock and Montague, Rock-Barber-Coman Sc., No., Michigan Tool Co., 7171 Ford, III. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Fellows Gear Shaper Co., 78 River St., Spring-field Vt. (Straight and Hourglass Types). Lees-Bradner Co., Cleveland, Ohio. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR FINISHING MACHINES

GEAK FINISHING MACHINES Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Gleaton Works, 1000 University Ave., Roches-ter 3, N. Y. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave. Detroit 2 Mich.

GEAR GRINDING MACHINES

GEAK GKINDING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17.
Gear Grinding Machine Co., 3901 Christopher
St., Detroit 11, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Lees-Bradner Co., Cleveland, Ohió.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES

Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS

See Speed Reducers

GEAR SHAVING MACHINES

Fellows Gear Shaper Co., 78 River St., Spring-field, Vt. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY

GEAR TESTING MACHINERY

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.

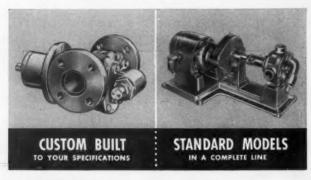
Brown & Sharpe Mfg. Co., Providence, R. I. Eastman Kodak Co., Rochester, N. Y. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.

Fellows Gear Shaper Co., 78 River St., Springfield, Vt. Gleason Works, 1000 University Ave., Rochester 3, N. Y. Co., Cleveland, Ohio. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS. Cut

GEARS, Cut

Automotive Gear Works, Inc., Richmond, Ind.
Bausch Machine Tool Co., 156 Wason Ave.,
Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring
Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North
Quincy, Mass.
Brad Foote Gear Wks, 1309 Sp. Cicero Ave.,
Chicago 50, Ill.
Chicago Rawhide Mfg. Co., 1371 Elston Ave.,
Chicago 22, Ill.
Cincinnati Gear Co., Wooster P ke and Mariemont Ave., Cincinnati, O'
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland Worm & Gear Co., 3249 E. 80th St.,
Cleveland Chio.
Cone-Drive Gears Div., Michigan Tool Co., 7200
E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave.,
Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.
Farrel-Birmingham Co., Inc., 25 Main St., An-Syracuse, N. Y.
Fairfield Mfg. Co., 2309 S. Earl Ave., Lafayette, Ind.,
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Gear Specialties Inc., 2635 W. Medill Ave.,
Chicago 47, Ill.
Greaves Machine Tool Co., 2009 Eastern
Avenue, Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead
Ave., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Illinois Gear & Mch. Co., 2120 No. Natchez
Ave., Chicago 35, Ill.
Lees-Bradner Co., Cleveland, Ohio.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
(Continued on page 296) (Continued on page 296)



NEED PUMPS to fit your machine or ? VIKING HAS THEM

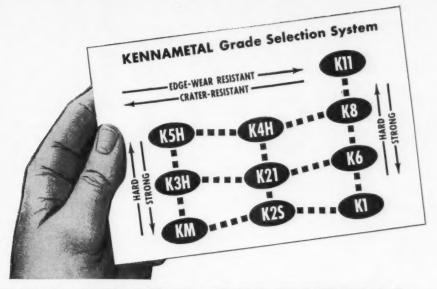
Here's how to make sure you have the right pump for each job. Let Viking engineers help you choose. With 750 catalogued models PLUS thousands of special models available, Viking can fit your need. Capacities range from

1/2 to 1050 gallons per minute. Whether you want to pump a light, highly-volatile liquid or a heavy, semi-solid type, Vikings will give you smooth, positive action. For more information, write for catalog 565] today.



VIKING PUMP COMPANY

Cedar Falls, Iowa, U.S.A. In Canada, it's "ROTO-KING" pumps See our catalog in Sweets



EXACT GRADE SELECTION NOW MORE VITAL THAN EVER ON YOUR NEW HIGH PRODUCTION MACHINES

Many metalworking shops are drifting along in a sea of profitless operation due to improper tool selection. Numerous shutdowns for tool replacement or regrinding, excessive tool breakage, or shortages along the production line due to tool trouble . . . all can shoot costs sky-high . . . make the difference between profit and loss.

Often it's just a matter of selecting the right tool and grade for the machining operation. When you specify Kennametal engineered tooling and the right grade of Kennametal,* you are giving your machines the BEST. You get consistent top performance at

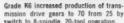
KENNAMETAL* Grade Selection Guide makes grade selection quick ... easy ... positive

The Kennametal Grade Selection Guide groups Kennametal grades according to strength, hardness, and wear characteristics. For example, it pinpoints the new K21 as a medium grade ideal For example, it pinpoints the new K21 as a medium grade loses for general purpose steel-cutting. If greater edge-wear resistance is required and the job permits a harder grade, K4H would be the choice. If cratering is excessive, the choice would be to the left, or grade K3H. Thus, the guide offers a selection of high crater-resistant, intermediate and high edge-wear resistant grades at each hardness level. every step in your operations . . . from the first run through each regrind, insert after insert, tool after

But be specific . . . specify the exact grade. A Kennametal Tool Engineer will gladly help you select the right grade for each operation. He works exclusively with Kennametal . . . applying and servicing it. He can show you reports of Kennametal's consistent repeat performance on all types of machining operations. KENNAMETAL INC., Latrobe, Pennsylvania.

PROVED BEST...TEST AFTER TEST







Grade K3H machined up to 400 swivel joint flanges per grind, against previous top of 20.





... Partners in Progress



*Registered Trademark

Give your machines the tools they deserve . . . the BEST

New Jersey Gear Mfg. Co., 1470 Chestnut Ave., Hillside, N. J., Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa. Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J. Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio. Verson Allsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, Ill. Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GEARS, Rawhide and Non-Metallic Boston Gear Works, 3200 Main St., North Quincy, Mass. Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Cincinnati Gear Co., Wooster Pike and Marie-mont Ave., Cincinnati, Ohio. Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.

Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa., Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS. Electric General Electric Co., Schenectady 5, N. Y. Lincoin Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio. Reliance Electric & Engrg, Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

GRADUATING MACHINES Gorton, Geo., Mch. Co., 1110 W. 13th St., Racline, Wis. Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.

GREASE Cities Service Oil Co., 70 Pine St., New York, N. Y. N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave.,
Philodelphio, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129
Lockwood St., Newark 5, N. J.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Strictair Refining Co., 600 5th Ave., New York,
N. Standard Oil Co. N. Y. Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, III. Sun Oil Co., 1608 Walnut St., Philadelphia. Texas Co., 135 E. 42nd St., New York, N. Y.

GRINDERS, Carbide Tool See Grinding Mches., Carbide Tool

GRINDERS, Die and Mold Consolidated Mch. Tool Corp., Rochester, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDERS, Oilstone, for Woodworking

Mummert-Dixon Co., Hanover, Pa.

GRINDERS, Pneumatic Chicago Pneumatic Tool Co., 6 E. 44th St. New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Madison-Kipp Corp., Madison, Wis. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill. Thor Power Tool Co., Aurora, Illinois

GRINDERS, Portable Electric and Toolpost GRINDERS, Portable Electric and Toolpost Chicago, Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Millers Falls Co., Greenfield, Mass. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Inc., Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio. Thor Power Tool Co., Aurora, Illinois

GRINDING FIXTURES Geometric Tool Co., (Die Chaser), Westville Station, New Haven 15, Conn. Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Mattison Mch. Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio. Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

GRINDING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati, Ohio.
U. S. Burke Machine Tool Div., Brotherton Rd.
17, Cincinnati 27, Ohio.

GRINDING MACHINES, Broach Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich. Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6. (Continued on page 298)



"Look! It soaks up grease just like a sponge."

Lan-O-Kleen removes 95% of all dirt and grime encountered in industry.

Easily — and safely!

L AN-O-KLEEN helps to protect the skin as it cleans. WEST – inpioneering the development of "double action" industrial cleaners - was the first to impregnate beneficial amounts of free lanolin into a corn meal type hand cleaner.

Lan-O-Kleen is economical to use.

It bulks greater than most other hand cleaners - therefore goes farther per pound. Too, the sturdy LAN-O-KLEEN dispenser rations just the

right amount to do a quick, thorough cleansing job.

L AN-O-KLEEN is one of a group of WEST products formulated for the prevention and control of industrial dermatitis. Workers' hands are their most valuable tools. By helping to prevent dermatitis, you can help keep costs down - by keeping workers on the job at maximum efficiency.

A specially trained WEST representative will gladly tell you more about LAN-O-KLEEN and the other products used in the WEST Dermatitis Control Plan. Just write or call your local WEST office.

OLDEST AND LARGEST COMPANY OF ITS KIND IN THE WORLD



Branches in Principal Cities

FREE BOOKLET

Use your business letterhead to request our 24 page booklet "The Control of Dermatitis in Industry."

WEST DISINFECTING COMPANY

Dept. M, 42-16 West St. Long Island City 1, N.Y.



In Canada: 5621-23 Casgrain Avenue, Montreal

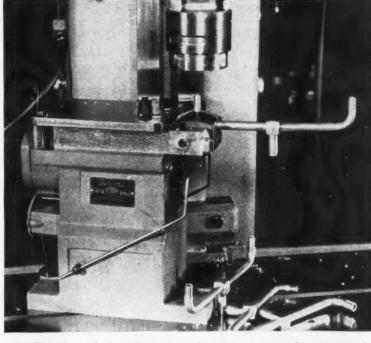
Quicker changeover, lower tooling costs...

with SNOW FULL UNIVERSAL MACHINES

ELECTRICALLY OPERATED AIR CONTROLLED AUTOMATIC OR SEMI-AUTOMATIC

Basic Master Fixtures for DRILLING, THREADING or TAPPING. Snow universal machines are the most flexible, most efficient, and most economical known. They save countless dollars in changeover time — help you start jobs sooner — assure quality at high production rates.

The square footage under a Snow Machine in your factory can be the most profitable in your whole plant. Submit details of your requirements.



AIR VISE holds part firmly — self-centering — always in exact position for precision work. U-shaped wire underneath provides quick finger-tip control, automatically starting spindle cycle. Jaw inserts keep tooling costs at minimum. Blank jaws always in stock — can be tooled to fit your part promptly, inexpensively.





Irregularly shaped parts are easily handled. Front feed permits close setting of guide plate for greater accuracy with high production. Here a short AIR VISE mounted on an offset table holds long tubing. Piece-part switch under table automatically closes vise and starts tapping operation.

SNOW MANUFACTURING CO., BELLWOOD, ILL.

(Suburb of Chicago)

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. Carboloy Dept., General Electric Co., Box 237, Rossevelt Park Annex, Detroit 32, Mich. Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

Osa, Corp., 405 Lexington Ave., New York 17, N. Y. DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio. Triplex Machine Tool Corp., 75 West St., New York 6, N. Y. Willey's Carbide Tool Co., 1340 W. Vernon Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio. Heald Machine Co., 10 New Bond St., Worces-ter 6, Mass. Landis Tool Co., Waynesboro, Pa. Triplex Machine Tool Corp., 75 West St., New York 6, N. Y. Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Chucking Baird Machines Co., 1700 Stratford Ave., Stratford, Conn. Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt. Bullard Co., Brewster St., Bridgeport, Conn. Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa. Norton Co., 1 New Bond St., Worcester 6,

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sogamore Rd., Worcester 5, Mass. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, Inndis. To., Co., Providence, R. I. Norton Co., 1 New Bond St., Worcester 6, Mass. Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass. Sheffield Corp., 721 Springfield St., Dayton 1,

Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDING MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn. Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Clinanati, Ohio.

GRINDING MACHINES, Drill

Gallmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich. Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis. rd Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Hamilton Div. of the Lodge & Shipley Co.,
Hamilton 1, Ohio.
Mattison Machine Works, Rockford, III.
Oliver Instrument Co., 1410 E. Maumee St.,
Adrian, Mich.
Orban Kurt & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.

GRINDING MACHINES, Flexible Shaft See Flexible Shaft Equipment

GRINDING MACHINES, Gop

Cincinnati Grinders, Inc., Cincinnati, Ohio. Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth See Gear Grinding Machines

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobbs, Etc.

Barber-Colman Co., Rock and Montague, Rock-ford, Ill. Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Mch. Co., Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17, N. Y.

N. Y.
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.
Gallmeyer & Livingston Co., 336 Straight Ave.,
S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 1314 St.,
Racine, Wis.

ter 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 1011.

Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Ingersoll Milling Mch. Co., Madison and
LeBland, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6,
Mass.

Edwards Rds., Cincinna.

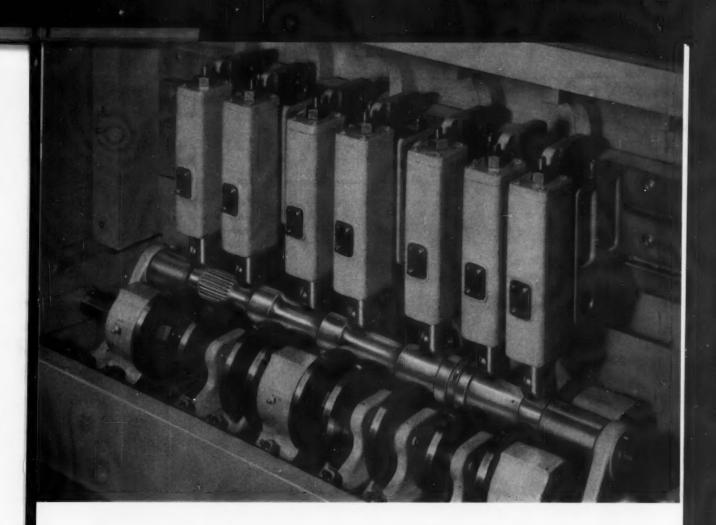
Norton Co., 1 New Bond St., Worcester o, Mass.

Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Prott & Whitney, West Hartford 1, Conn.
Standard Electrical Tool Co., 2488-90 River Rd., Clincinnati, Ohio
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio, Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

DoAll Co., 254 N. Laurel Ave., Des Plaines, III. (Continued on page 300)





How to eliminate your shaft distortion problems

Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed,

pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$ " to 4" in diameter, 6" to 40" in length, with integral cams or shoulders up to 8" diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.



The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.



EASON WORKS

Builders of bevel gear machinery for over 90 years 1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
South Bend Lathe Works Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Clincinnati, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester S, Mass. Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt. Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Heald Machine Co., 10 New Bond St., Worcester 6, Mass. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Rivett Lathe & Grinder Inc., Brighton, Boston 35, Mass. Standard Electrical Tool Co., 2448-90 River Rd., Cincinnati, Ohio. Wicoco Mch., Corp., Wayne Junction, Philadel-phia, Pa.

GRINDING MACHINES, Jig

Moore Special Tool Co. Inc., 724 Union Ave., Bridgeport, Conn. Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

GRINDING MACHINES, Piston Ring

Besty-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Wis.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Mattison Machine Works, Rockford, III.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Profile

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Ex-Celi-O Corp., 1200 Oakman Blvd., Detroil
32, Mich.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Sheffield Corp., 721 Springfield St., Dayton 1.
Ohio.

GRINDING MACHINES, Ring Wheel Ball Race, Etc.

Landis Tool Co., Waynesboro, Pa. Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radial

Consolidated Mch. Tool Corp., Rochester, N. Y. Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio.
Sundstrand Mch., Tool Co., 2531 11th St., Rockford, III.

GRINDING MACHINES, Radius, Link

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Mattison Machine Works, Rockford, III. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

GRINDING MACHINES, Roll

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Farrel-Birmingham Co., 25 Main St., Ansonia. Conn.
Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6.
Mass.

GRINDING MACHINES, Spline Shaft

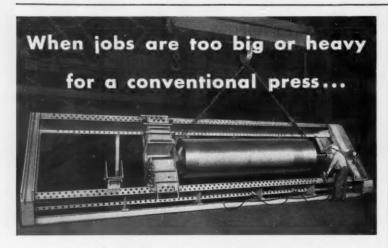
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Surface

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary) Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Blanchard Machine Co., 64 State St., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Gardner Machine Co., 414 E. Gardner St.,
Beloit, Wingston Co., 336 Straight Ave.,
S. W., Grand Rapids 4, Mich.
Hamilton Div. of the Lodge & Shipley Co.,
Hamilton I, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Hill Acme Co., 1201 W. 65th St., Cleveland 2.
Ohio. Ohio. Mattison Machine Works, Rockford, III. Norton Co., 1 New Bond St., Worcester 6. Mass. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Pratt & Whitney, West Hartford 1, Conn. Reid Bros. Co., Inc., Beverly, Mass. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Standard Electrical Tool Co., 2488-90 River
Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St.,
Springfield, Ohio.
Walker, O. S.. Co., Inc., Worcester, Mass.

GRINDING MACHINES, Top

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Jones & Lamson Mch. Co., 160 Clinton 5t. Springfield, Vt. (Continued on page 304)



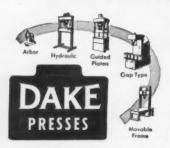
THE DAKE HORIZONTAL INCLINED PRESS is recommended for work on jobs that are so big or heavy that it is more convenient to do press work while they remain suspended from an overhead crane or hoist.

For instance in the illustration above, a 7-inch shaft is being pressed into the cable drum for a 200-ton overhead traveling crane. The drum is 17 feet long and 4 feet in diameter, and is supported on a crane hook.

This particular press (Model 32-100) is 33 feet long overall, and has a daylight opening of 25 feet. It has 300 tons capacity, a 60° inclined frame, 26-inch stroke, and a ram-to-table distance from 25 inches to 25 feet. The table is moved along the frame with a hand winch.

Dake Hydraulic Presses are engineered to meet such a variety of shop requirements that the engineering is probably almost done on the press you need. Let us quote.

DAKE CORPORATION, 604 Seventh St., Grand Haven, Mich.



Send for Big New Catalog

Blacks and my Cat			
Please send me Cate	alog No. 3	50.	
Name			
Company			
Address			

EXTRA-RUGGED SPINDLE

The extra-rugged spindle, with preloaded angular contact double row ball bearings at the nose, is designed to withstand high tool pressure with no end or side play. Clutch and transmission load has been eliminated. The sheave bearing is mounted directly to the housing.

ANGULAR POSITION OF TURRET

Turret moves freely on replaceable ways of heavy, rigid construction. A 10° offset of the turret causes accurate seating during heavy cutting. Angular position allows greater clearance for larger end working tools, thereby attaining greater accuracy.

HEAVY DUTY CROSS-

utmost forming precision.

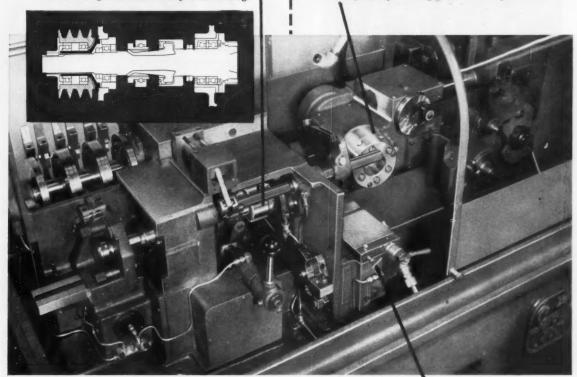
A side mounted arrangement of the

cross-slide creates a seating action of the dovetail. This seating action increases with the cutting pressure, consequently

reducing or eliminating the possibility of chatter. Heavy forming on all slides is possible because of this heavy duty

dovetailed construction which offers

SLIDE DOVETAILS



3 "precision" reasons why the Detroit Screwmatic 750 out-performs competition in production runs

In actual tests with three leading screw machines, the Detroit Screwmatic 750 has manufactured complicated pieces 300% faster while holding tolerances as close as ± .0003".

This unusual performance is typical of what you can expect from the truly advanced design features of the Detroit Screwmatic 750. Illustrated here are just three of the "precision" factors which make it possible.

You'll want to know more about the revolutionary Detroit Screwmatic 750 and how it can increase the efficiency of your screw machine operations. Write today for complete information. It will be sent to you immediately.

DETROIT

Screw Matie

A Product of

THE GEAR GRINDING MACHINE CO.

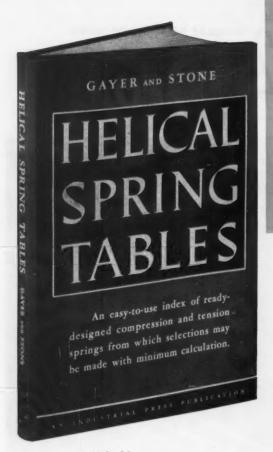
3921 Christopher

Detroit 11, Michigan

Manufacturers of: Fully Automatic Gear Grinding Machines *
Rxeppe (prenounced "Shappe") Constant Velocity Univer-



MACHINERY, January, 1956-301



A Valuable
Working Tool
for Designers
Engineers
Draftsmen
Machinists
Toolmakers.

165 Pages

6 x 9 Inches

\$5.00

In Canada or overseas, \$5.75

CUT and TRY NO MORE!

Eliminate Trial and Error Methods in Spring Design and Specification

HELICAL SPRING TABLES, by John D. Gayer and Paul H. Stone, Jr., makes it quicker, easier and simpler for you to design and specify springs to meet your exact requirements. It provides:

● An easy to use index of over 6800 ready-designed compression and tension springs from which selections may be made, with minimum calculation, to meet a wide range of design requirements.

 Factors for modifying the tabulated data to suit special requirements regarding spring material, service life, or stress range.

• Data for use in preliminary designs, where it is important to have advance information on the space requirements of the springs to be used.

 Data that can be used as a starting point in the design of springs to exacting specifications. Otherwise, cut and try methods of calculation must be used.

• Tables of compression springs arranged by coil diameters of from 1/8 inch to 4 inches.

Tables of tension springs arranged by coil diameters of from 1/8 inch to 2 inches.

 Complete instructions and examples of how to use the tables to select the correct spring for every application.

Order your copy of HELICAL SPRING TABLES today. If you wish you may examine it free under our Five-Day Free Inspection Plan, paying for it only after you have examined it, used it, and seen how much it can help you in your work. Or, if you send payment with your order we shall send the book postpaid. Of course, you may return the book for full refund if it does not meet your requirements. Just fill in and mail the Order Form below.

MAIL THIS ORDER FORM TODAY

CHOOSE METHOD OF PAYMENT DESIRED

- t enclose check or money order in full payment. I may return the book for full refund if not satisfied.
- ☐ Bill me under Five-Day Free Inspection Plan.
- ☐ Bill Company.

THE INDUSTRIAL PRESS, 93 Worth St., New York 13, N.Y.

M/1-56

how leading car, truck and trailer builders solve production riveting problems with Hannifin "HY-POWER" **Hydraulics**

They select the correct size "Hy-Power" Hydraulic Cylinders



Hannifin supplies "Hy-Power" Hydraulic Cylinders in $7\frac{1}{2}$ to 100-ton capacities (more in multiple) to exert the force exactly when and where you want it.

They mount the cylinders in Hannifin "C"-Frames



The "Hy-Power" line includes standard "C"-frames in a wide variety of sizes and types for portable or stationary use. Or, if your requirements are special, Hannifin will design and build "C"-frames to suit your needs.

Power source is the exclusive "Hy-Power"

Pressure Generator

Here's Hannifin's patented, noiseless pressure generator. It's a compact unit that combines motor, pump, oil reservoir, control valves and highpressure intensifier.



HANNIFIN "HY-POWER" RIVETING
IS THE LONG-TIME STANDARD OF
THE AUTOMOTIVE INDUSTRY

If you're looking for a better riveting method whether you need one riveter or fifty—discuss it with your Hannifin representative. Meanwhile, get the full story by writing for Bulletin 150.



Hannifin Corporation, 509 S. Wolf Rd., Des Plaines, III.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

GKINDING MACHINES, Thread

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. 32, Mich. Hirschmann Co., Carl, 30 Park Ave., Man-nasset, N. Y. Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Landis Machine Co. (Centerless), Waynesbaro, Pa. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Sheffield Corp., 721 Springfield St., Dayton 1,

GRINDING MACHINES, Universal

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Grinders, Inc., Cincinnati, Ohio. Landis Tool Co., Woynesboro, Po. Norton Co., I New Bond St., Worcester 6, Mass. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.

GRINDING MACHINES, Worm

Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt. Pratt & Whitney, West Hartford 1, Conn.

GRINDING WHEELS

Besly-Welles Corp. (Abrasive Div.), 20 N. Wacker Drive, Chicago 6, Ill. Blanchard Machine Co., 64 State St., Cam-bridge, Mass. Carborundum Co., Buffalo Ave., Niagara Falls,

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Cincinnati Milling Products Div., Cincinnati Milling Machine Co., Cincinnati, Ohio.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III,
Gardner Machine Co., (Surface Grinder), 414 E.
Gardner St., Beloit, Wis.
Macklin Co., 2925 Wildwood Ave., Jackson,
Mich.
Norton Co., 1 New Bond St., Worcester 6,
Mass.
Precision Diagnond Toal Co., 102 South Grove.

Mass.
Precision Diamond Tool Co.. 102 South Grove
Ave., Elgin, III.
Simonds Abrasive Co., Tacony and Fralev Sts.,
Bridesburg, Philadelphia, Pa.
Smit, J. K. & Sons, Inc., Murray Hıll, N. J.

GROOVING TOOLS, Internal

Waldes Kohinoor, Inc., 4716 Austel Place, Long Island City 1, N. Y.

HAMMERS, Drop

Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio. Chambersburg Engrg. Co., Chambersburg, Pa. Erie Foundry Co., Erie, Pa.

HAMMERS, Forging Air

Chambersburg Engra. Co., Chambersburg, Pa. Erie Foundry Co., Erie, Pa. Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.

HAMMERS, Pneumatic

Chambersburg Engrg. Co., Chambersburg, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

HAMMERS, Portable Electric

Millers Falls Co., Greenfield, Mass. Thor Power Tool Co., Aurora, Illinois

HAMMERS, Power

Chambersburg Engrg. Co., Chambersburg, Pa. Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del.

HAMMERS, Shaft

Standard Pressed Steel Co., Jenkintown, Pa.

HAMMERS, Soft

Chambersburg Engrg. Co., Chambersburg, Pa Chicago Rawhide Mfg. Co., 1301 Elstor: Ave., Chicago 22, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

HARDENING EQUIPMENT

Gleason Works, 1000 University Ave., Rochester, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave.,
Cleveland Ohio Cleveland, Ohio.

HARDENING MACHINES, Flame

Cincinnati Milling Machine Co., Cincinnati, Ohio. Gleason Works, 1000 University Ave., Rochester, N. Y.

HARDNESS TESTING INSTRUMENTS

Olsen, Tinius, Testing Mch. Co., Willow Grove, Pa.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Shore Instrument & Mfg. Co., Van Wyck Ave., and Carll St., Jamaica, N. Y.
Wilson Mechanical Instrument Co., Inc., 230-D Park Ave., New York, N. Y.

HEADING MACHINES

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

HOBBING MACHINES

See Gear Cutting Machines, Spur and Helical Gears (Hobbing), and Gear Cutting Machines, Worm and Worm Wheels.

HOBS

Barber-Colman Co., Rock and Montague, Rock-ford, III. Brown & Sharpe Mfg. Co., Providence, R. I. Lees-Bradner Co., Cleveland, Ohio. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. National Twist Drill & Tool Co., Rochester. Mich.
Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut
Ave., Hillside, N. J.
Union Twist Drill Co., Athol, Mass.

HOIST HOOKS

Bethlehem Steel Co., Bethlehem, Pa. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y. (Continued on page 306)



More CECO (to be exact, 410 5

The piston-lift gravity drop hammer with short stroke control

CHAMBERSBURG

THE HAMMER BUILDERS

CHAMBERSBURG ENGINEERING CO.

Buildon of THE IMPACTER

CHAMBERSBURG, PENNSYLVANIA

HOISTING AND CONVEYING EQUIPMENT

Cleveland Crane & Engrg. Co., Wickliffe, Ohio.

HOISTS, Air

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersall-Rand Co., Phillipsburg, N. J. Thor Power Tool Co., Aurora, Illinois

HOISTS, Chain, Etc.

Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

HOISTS, Electric

Philadelphia Gear Works Inc., Erie Ave. and G St. Philadelphia, Pa. Philips and Davies, Inc., 920 Steiner Ave., Kenton, Ohio

HONING MACHINES, External

Barnes Drill Co., 814 Chestnut, Rockford, Ill. Micromatic Hone Corp., 8100 Schoolcraft, De-troit 4, Mich. Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING MACHINES, Internal (Cylinder)

Barnes Drill Co., 814 Chestnut, Rockford, III. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Rockford, III.
Micromatic Hone Corp., 8100 Schoolcraft, De-troit 4, Mich.
Moline Tool Co., 102 20th St., Molline, III.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HONING STONES

Barnes Drill Co., 814 Chestnut St., Rockford,

Carborundum Co., Buffalo Ave, Niagara Falls, N. Y.
Moline Tool Co, 102 20th St., Moline, Ill.
Norton Co., 1 New Bond St., Worcester 6,
Mass.

HONING TOOLS AND FIXTURES

Barnes Drill Co., 814 Chestnut, Rockford, III. Micromarie Hone Corp., 8100 Schoolcraft, De-troit 4, Mich. Sunnen Products Co., 7900 Manchester Ave., St. Louis 17, Mo.

HOSE, Leather, Rubber, Metallic, Etc.

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

HYDRAULIC MACHINERY Tools and equipment

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.

Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

III. Barnes, John S., Corp., Rockford, III. Bethlehem Steel Corp., Bethlehem, Pa. Birdsboro Steel Fdry. & Mch. Co., Birdsboro,

Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio
Chambersburg Engrg Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P.O. Box 37,
Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Denison Engrg Co., 1160 Dublin St., Columbus
16, Ohio.
Erie Foundry Co., Erie, Pa.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
III.

Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1,

N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Michigan Drill Head Co., Detroit 34, Mich.
Modern Ind. Engrg. Co., 14230 Birwood Ave.,
Detroit 4, Mich.
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Wis.

Wis.
Philips and Davies, Inc., 920 Steiner Ave.,
Kenton, Ohio
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.
Vickers Incorporated, Div. of Sperry Rand
Corp., 1402 Oakman Bivd., Detroit, Mich.
Wilson. K. R., Inc., 211 Mill St., Arcade N. Y.

HYDRAULIC POWER UNITS OR TOOL HEADS

Barnes Drill Co., 814 Chestnut, Rockford 3, III.
Barnes, John S., Corp., Rockford, III.
Barnes, W. F. & John Co., 201 S. Waterford
St., Rockford, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio Michigan Drill Head Co., Detroit 34, Mich.
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Plight Lethe Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.
Vickers Incorporated, Div. of Sperry Rand
Corporation, 1402 Oakman Blvd., Detroit,
Mich. Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

INDEXING AND SPACING EQUIPMENT INDEXING AND SPACING EQUIPMENT

Axelson Mfg. Co., 6160 S. Boyle Ave., Los
Angeles 58, Cal.

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.

Hartford Special Mchry. Co., 287 Homestead
Ave., Hartford, Conn.

Michigan Drill Head Co., Detroit 34, Mich.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rockford, III.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.

(Continued on page 308)

(Continued on page 308)

The MODERN AUTOMATIC CUTTING-OFF MACHINE



Cuts Off Tubing, Pipe and Shafting . . . FAST

Cuts off longer pieces than a regular automatic machine. In fact, cuts off any length you want-and cuts it faster. If your production requires quantity cutting-off of tubing, pipe or shafting, check the figures below against your present time.

1/2" Tubing

1 1/4" Cold Rolled

1" Tubing

This machine cuts off and chamfers both outside edges of V_5 " .030 wall tubing, 5" long, at the rate of one every 2.5 seconds.

This machine cuts off and chamfers both ends of 11/4" cold rolled, 20" cold rolled, long, at the rate of one every 20 seconds.

This machine cuts off and chamfers both outside edges of 3" long, at the rate of one every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 63/4" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

WRITE FOR ILLUSTRATED CATALOG

MODERN MACHINE TOOL CO. Jackson, Michigan



FIRST MATHED HARDENED COLUMNS

for 9" and 11" radials



Now, for the first time, you can gain the advantages of hardened columns on radial drilling machines with 9" and 11" columns. Because they resist scoring and hold dimensional accuracy under most extreme conditions, these new columns may well add years of service to our machines.

We offer them to industry only after several years of experimenting and testing have proved our procedure. After we turn the cast columns, we flame-harden them to Rockwell C 52-56, at a depth of 1/16" to 3/2". Then we finish grind them to close tolerances in straightness, roundness, and surface finish.

It will be worth your time to write us today. The Cincinnati Gilbert Machine Tool Co. 3366 Beekman St., Cincinnati 23, Ohio

A 3' arm 9" column radial can be purchased for as little as \$1100 down and \$80.67 a month for five years. Includes 6% simple interest (or about 3% add-on).

those who buy Gilbert buy GILBERT again

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III. Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa. Taft-Peirce Mfg. Co., Woonsocket, R. I. Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

INDICATORS, Dial

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Speed

Brown & Sharp Mfg. Co., Providence, R. I. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass.

INDICATORS, Test

Ames, B. C., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Instrument Co., 735 Carnegie Ave.,
Cleveland 15, Ohio.
Federal Products Corp., P.O. Box 1027, Providence, R. I.
Scherr, George Co., Lee dence, R. I. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y. Standard Gage Co., Inc., Poughkeepsie, N. Y. Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y. Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INTENSIFIERS, Hydraulic

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa. Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

JIG BORER

See Boring Machines, Jig

JIGS AND FIXTURES

JIGS AND FIXTURES
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
National Broach & Machine Co., 5600 St. Jean St., Detroit 13, Mich.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio. Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

KEYS, Woodruff, Machine, Special

Standard Automotive Parts Co., 660-668 Nims St., Muskegon, Mich.

KEYSEATERS

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio. Consolidated Mch. Tool Co., Rochester, N. Y. Davis Keyseater Co., 405 Exchange St., Roches-ter 8, N. Y. Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass. Mitts & Merrill, 68 Holden St., Saginaw, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I. Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Pratt & Whitney, West Hartford 1, Conn. Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N., Y

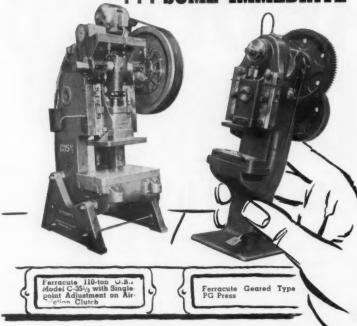
LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating), 814 Chestnut St., Rockford, III. Cincinnati Chrinders, Inc. (Centerless), Cincin-Cincinnati Grinders, Inc. (Centeriess), Cincinnati, Ohio,
Crane Packing Co., 1800 Cuyler Ave., Chicago, III. (Lapmaster Div.)
Fellows Gear Shaper Co., 78 River St., Springfield, Vr.
Gleason Works, 1000 Unviersity Ave., Rochester, N. Tool, Co., 7171 E. McNicholz, Bd. Gledson Works, 1000 University Ave., Rochester, N.Y.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6,
Mass. Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago. Hirschmann Co., Carl, 30 Park Ave., Man-hasset, N. Y. (Continued on page 310)

Punching Presses up to 110 tons Ready for Prompt Shipment SOME IMMEDIATE



As near to off-the-shelf delivery as it is possible to get. If your plane call for really fast installation of Punching Presses, Ferracute is your source. A complete line of Ferracute Punching Presses 20 to 200 ton

FERRACUTE MACHINE CO.

Manufacturers of Power Presses and Special Machinery BRIDGETON, NEW JERSEY, U.S.A.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

LATHE ATTACHMENTS

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., P.O. Box 15335, Vernon Sta., Los Angeles 58, Cal.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St. Rockford III

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2431 11th St., Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Automatic

LATHES, Automatic

Axelson Mfq. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Boird Machine Co., 1700 Stratford Ave., Stratford, Cann.
Bullard Co., Brewster St., Bridgeport 2, Conn. Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Cone Automatic Mch. Co., Inc., Windsor, Vt. Cross Co., 3250 Belevue Ave., Defroit 7, Mich. Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn. Hydro-Feed Machine Tool Carp., 730 W. Eight Mile Rd., Ferndale 20, Mich.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K. Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford I, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ach., New York 17, N. Y.
Seneca Folls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

LATHES, AXIE

Consclidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.

Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.

LATHES, Bench

Atlas Press Co., Kalamazoo, Mich. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Levin, Louis & Son, Los Angeles 21, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox
Ave., Chicaga 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind. LATHES, Boring

LATHES, Boring
Axelson Mtg. Co., 6160 S. Boyle Ave., Los
Angeles 58, Cal.
Baldwin-Lime-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and
Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y. LeBland, R. K., Mch Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

LATHES, Double-End

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio.
Consolidated Mch. Tool Con., Rochester, N. Y. LeBland, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

LATHES, Duplicating

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles SB, Cal. Hydro-Feed Machine Tool Corp., 730 W. Eight Mile Rd., Ferndale 20, Mich. Lodge & Shipley Co., 3055 Colerain Ave., Cin-cinnati 25, Ohio. Monarch Machine Tool Co., 27 Oak St., Sidney, Monarch muchine Tool Co., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.

(Continued on page 310)



LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Atlas Press Co., Kalamazoo, Mich.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles S8, Cal.
Barber-Colman Co. (Hendey Mch. Div.) Rockford, Ill.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Loul Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio. N. Y.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
LeBiond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
odge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Manarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Orban, Kurt. Co., Inc., 24, 517

Ohio. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Pratt & Whitney, West Hartford 1, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston

Rivert Larine & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Co., Sidney, Ohio.

South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gop

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Cincinnati Latine & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Stidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasev Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

LATHES, Gun

Axelson Mtg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Consolidated Mch. Tool Corp., Rochester, N. Y. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Seneca Falls, Mch. Co., Seneca Falls, N. Y. Springfield Machine Tool Co., Springfield, Ohio.

LATHES, Hollow Spindle

Axelson Mg. Co., P.O. Box 15335, Vernon Sta, Los Angeles 58, Calif. LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio. Lodge & Shipley Co., 3055 Colerain Ave., Cin-cinnati 25, Ohio. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Manufacturing Type

Axelson Mfg. Co., 6160 S. Boyle Ave., Los
Angeles 58, Cal.
Hydra-Feed Machine Tool Corp., 730 W. Elght
Mile Rd., Ferndale 20, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning

Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio. Ohio. Ferracute Machine Co., Bridgeton, N. J.

LATHES. Toolroom

See Lathes, Engine and Toolroom

LATHES, Turret

Bardons & Oliver Inc., Ft. W. 9th St., Cleveland 13, Ohio.

Frewn & Sharpe Mfg. Co., Providence, R. I.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Cosa Corp., 405 Lexington Ave., New York 17,

N. Y.

Gisholt Machine Co., 1245 E. Washington Ave.,

Madison 10, Wis.

Hardinge Brothers, Inc. (Bench or Cabinet

Mounting), 1418 College Ave., Elmira, N. Y.

Springfield, Vt.

LeBlond, R. K., Mch. Tool Co., Madison and

Edwards Rds., Cincinnati 18, Ohio.

Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey

City 3, N. J.

Potter & Johnston Co. (Automatic), 1027 New
port Ave., Pawtucket, R. I.

Rivett Lathe & Grinder, Inc., Brighton, Boston

35, Mass.

South Bend, Lathe Works, Inc., 425 E. Madison

St., South Bend, Ind.

Springfield Mch. Tool Co., Springfield, Ohio.

Triplex Machine Tool Corp., 75 West St., New

York 6, N. Y.

Warner & Swasey Co., 5701 Carnegie Ave.,

Cleveland 3, Ohio.

LATHES, Vertical Turret

American Steel Foundies, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baird Machine Co. 1700 Stratford Ave., Stratford, Conn.
Boldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.

LAYOUT FLUID

Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

Bullard Co., Brewster St., Bridgeport 2, Conn. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I. Wyler Max, 611 W. 43rd St., New York 36, N. Y.

LIGHTS, Indicator

Dialight Corporation, 60 Stewart Ave., Brook-lyn 37, N. Y.

LOCATORS, for Jig Borers

Arter Grinding Machine Co., 15 Sagamore Rd., Worcester 5, Mass.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Houghton, E. F., & Co., 303 W. Lehigh Ave.,
Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120
Lockwood St., Newark 5, N. J.
Shell Oil Co., 50 W. 50th St., New York, N. Y.
Sinclair Refining Co., 600 5th Ave., New
York, N. Y.



Socony Mobile Co., Inc., 26 Broadway, New York, N. Y.
Socony, N. Y.
Socony, N. Y.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 33, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa. Texas Co., 135 E. 42nd St., New York, N. Y. White & Bagley Co., Worcester, Mass.

LUBRICATING SYSTEMS

Farval Corp., 3249 E. 80th St., Cleveland, Ohio. Madison-Kipp Corp., Madison, Wis. Norgren, C. A., Co., Inc., 3419 S. Elati St., Englewood, Colo. Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, III. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

MACHINISTS' SMALL TOOLS

See Calipers, Hammers, Wrenches, Drills, Taps, etc.

MAGNETIC BASES FOR INDICATORS

du Mont Corp, Greenfield, Mass.

MANDRELS

See Arbors and Mandrels

MARKING MACHINES AND DEVICES

Acromark Co., 9-11 Morrell St., Elizabeth 4, N. J. Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.

MEASURING MACHINES AND **INSTRUMENTS**, Precision

Cleveland Instrument Co., 735 Carnegie Ave., Cleveland 15, Ohio. Crane Packing Co., 1800 Cuyler Ave., Chicago. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Federal Products Corp., P.O. Box 1027, Provi-dence, R. I. Lufkin Rule Co., Hess Ave., Saginaw, Mich., Max Wyler, 611 W. 43rd St., New York 36, N. Y. Norma-Hoffman Bearings Corp., Stamford, Conn. Conn.
Fratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio. Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Taft-Peirce Mfg. Co., Woonsocket, R. I.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS

See Recording Instruments

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Lufkin Rule Co., Hess Ave., Saginaw, Mich. Millers Falls Co., Greenfield, Mass. Pratt & Whitney, West Hartford I, Conn. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol, Mass.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

MILLING ATTACHMENTS

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.

Brown & Sharpe Mfg. Co., Providence, R. I. Cincinnati Milling Machine Co., Cincinnati,

Ohio. Consolidated Machine Tool Corp., Rochester, N. Y. Gorton, George, Mch. Co., 1110 W. 13th St.,

Gorton, George, Mch. Co., 1110 W. 13th St., Roccine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., Brighton, Boston
35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waitham St., Watertown,
Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7,
Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

MILLING MACHINES, Automatic

Cincinnati Milling Machine Co., Cincinnati, Ohio. Consolidated Machine Tool Corp., Rochester,

Consolidated Machine Tool Corp., Rochester, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

MILLING MACHINES, Bench

Atlas Press Co., Kalamazoo, Mich.
Hardinge Bros., Inc., (Bench or Pedestal Type).
1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
U. S. Burke Machine Tool Div., Brotherton Rd.,
Cincinnati 27, Ohlo.

(Continued on page 312)



MILLING MACHINES, Circular,

Continuous
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St., and Girard
Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphio, P.a., Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill. Ave., Philodelphio, Ingersoll Milling Mch. Co., 2442 Lought.
Ingersoll Milling Mch. Co., 2442 Lought.
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

MILLING MACHINES, Hand

AILLING MACHINES, Hand

Axelson Mfg. Co., 6160 S. Boyle Ave., Los
Angeles 58, Cal.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave.,
White Plains. N. Y.
U. S. Burke Machine Tool Div., Brotherton Rd.,
Cincinnati 27, Ohio.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield
7, Mass.

MILLING MACHINES, Horizontal, Plain And Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains. N. Y. Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Div., Hamilton, Ohio.

Brown & Sharpe Mtg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N.Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Rocine, Wis.
Greaves Machine Tool Co., 2009 Eastern Avenue, Cincinnati, Ohio.
Ingersoll Milling Mch Co., 2442 Douglas St., Rockford, III.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Sheldan Machine Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41. III.
Snyder Tool & Engrg. Co., 3400 F. Lafayette
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.
Van Norman Co., 3640 Main St., Springfield
7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I. Sunstrand Mch.. Tool Co., 2531 11th St., Rockford, III.

MILLING MACHINES, Planer Type

Baldwin-Lima-Hamilton Corp., Lima Hamilton Baldwin-Lima-Hamilton Corp., Lima Hamilton, Div., Hamilton, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y. Espen-Lucas Mch. Works, Front St., and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave., and Penn.
R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co. 2442 Douglas St.,
Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio. Cosa Corp., 405 Lexington Ave., New York 17. Ex-Cell-O Carp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 29, Pa.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

MILLING MACHINES, Ram Type Universal

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Bridgeport Machine, Inc., Linley Ave., Bridge-port, Conn.

MILLING MACHINES, Vertical

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool. Consolidated Machine Tool Corp., Rochester, N. Y. N. Y. Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, III. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Rockford, III.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St.,
Rockford, III.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Pratt & Whitney, West Hartford 1, Conn.
Sinyder Tool & Engrg. Co., 3400 E. Lafayette,
Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, III.
U. S. Burke Machine Tool Div., Cincinnati 27,
Ohio.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools

MOLD AND DIE COPYING MACHINES

Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. Cincinnati Milling Mch. Co., Oakley, Cincin-nati 9, Ohio. Cosa Corp., 405 Lexington Ave., New York 17. Gorton, Geo., Mch. Co., 1110 W. 13th St., Cosa Corp., 405 Lexington Ave., New York 17. Cosa Corp., 405 Lexington Ave., New York 17. Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis. Pratt & Whitney, West Hartford 1, Conn. Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio. Erie Foundry Co., Erie, Pa. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rickford, III.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, III.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio. General Electric Co., Schenectady, N. Y. Howell Electric Motors Co., Howell, Mich. Reliance Electric & Engra. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.

MOTORS, Hydraulic

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. ndstrand Mch. Tool Co., 2531 11th St., Rockford, III.

MULTIPLE-SLIDE FORMING MACHINES

U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

International Nickel Co., Inc., 67 Wall St., New York, N. Y. Wales-Strippet Corp., North Tonawanda, N. Y.

NIPPLE THREADING MACHINERY

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill. Parker-Kalon Div., General American Trans-portation Corp., 200 Varick St., New York, N. Y.

NUTS, Thumb or Wing and Cap Williams, J. H., & Co., 400 Vulcan St., Buffalo 7, N. Y.

OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Mch. Corp., Wayne Junction, Philadel-phia, Pa.

OIL SEALS

Chicago Rowhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Crane Packing Co., 1800 Cuyler Ave., Chicago, III. Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Cities Service Oil Co., 70 Pine St., New York, N. Y. N. Y. Houghton & Co., E. F., 303 W. Lehigh Ave., Philodelphia, Pa. Shell Oil Co., 50 W. 50th St., New York, N. Y. Sinclair Refining Co., 600 5th Ave., New York. Socony Mobil Co., Inc., 26 Broadway, New York, N. Y. Standard Oil Co., (Indiana), 910 S. Michigan, York, N., C., (Indiana), YIV S., Kandard Oil Co., (Indiana), YIV S., Kandard Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, III.
Sun Oil Co., 1408 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.

OILS, Quenching and Tempering

Cities Service Oil Co., 70 Pine St., New York N. Y. Houghton & Co., E. F., 303 W. Lehigh Ave., Philodelphia, Pa. Shell Oil Co., 50 W. 50th St., New York, N. Y. Sinclair Refining Co., 600 5th Ave., New York. York. Standard Oil Co., (Indiana), 910 S. Michigan Chicago, III. Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, III.

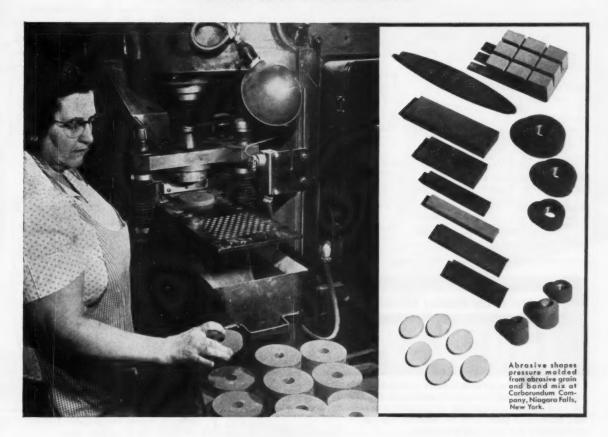
OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc. (Continued on page 314)

Molding abrasives 50% faster with

DENISON MULTIPRESS®

with no downtime



 $\mathbf{P}_{\text{Shapes}}$. On operations requiring both molding and cutting, production is increased over 100%.

The operation is semi-automatic . . . the operator has only to remove the molded shapes.

The abrasive grain mix is hopper fed to a shuttle box. The shuttle box automatically indexes into position beneath the Multipress hydraulic ram. Ram pressure, set with hydraulic controls, is precisely duplicated on each stroke. Uniform density of abrasive grains is thus assured on every molded shape . . . with minimum operator training.

Molding dies are reset in a few minutes for different jobs.

What's your production problem? Compacting, riveting, staking, swaging, drawing... any operation calling for controlled ram pressure can be greatly improved with the Denison hydraulic Multipress. Have the Denison representative show facts and figures how you can benefit ... now. Write

THE DENISON ENGINEERING COMPANY

1244 Dublin Road • Columbus 16, Ohio
A Subsidiary of America 1 Brake Shoe Co.



OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Special

ORDNANCE MACHINES, special
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Michigan Drill Head Co., Detroit 34, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee
St., Rockford, III.
Verson Allsteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, III.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Crane Packing Co., 1800 Cuyler Ave., Chicago. Garlock Packing Co., Palmyra, N. Y. Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.

PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio.

PARALLELS

PAKALLELS
Brown & Sharpe Mfg. Co., Providence, R.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Norma-Hoffman Bearings Corp., Stamford, Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y. American Brass Co., 25 Broadway, New York, N. Y. Mueller Brass Co., Port Huron 35, Mich. Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey City 3, N. J. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE, Steel

PIPE, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa.

Bethlehem Steel Co., Bethlehem, Pa.

Orban, Kurt, & Co., Inc., 205 E. 42nd St., New
York 17, N. Y.

Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.

United States Steel Corp., National Tube Co.,
Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, Ohio. Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicogo, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

PLANER ATTACHMENTS

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y. Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Gray, G. A., Co., Woodburn Ave., and Penn R. R. Evanston, Cincinnati, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, III.

Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

PLANERS

Young Mch. Tool Div., Church Rd., Bridgeport,

PLANERS, Double Housing and Openside

PLANERS, Double Housing and Openside
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton
Div., Hamilton, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Cleveland Punch & Shear Works Co., 3917 St.
Cleveland Punch & Shear Works Co., 3917 St.
Cleveland Foreign Consolidated Mch. Tool Corp. (Incl. Plate).
Consolidated Mch. Tool Corp. (Incl. Plate).
Consolidated Mch. Tool Corp. (Incl. Plate).
Rotary and Crank Types), Rochester, N. Y.
Giddings & Wis.
Giddings & Co., Woodburn Ave., and Penn
Rockford Machine Tool Co., 2500 Kishwaukee
St., Rockford, Ill.,
Young Mch. Tool Div., Church Rd., Bridgeport,
Pa.

PLATE ROLLS

PLATE ROLLS
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch., Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.

PLATES, Angle

Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa.

PLATES, Surface

PLAIES, JUPTace
Brown & Sharpe Mfg. Co., Providence, R. I.
Challenge Machinery Co., Grand Haven, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Pratt & Whitney Div., West Hartford I, Conn.
Scherr, George Co., Inc., 200 Lafayetre St.,
New York 12, N. Y.
Swanson Tool & Machine Products, Inc., 854
E. 8th St., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St.,
Ampere, N. J.

PNEUMATIC EQUIPMENT

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.
Ingersoll-Rand Co., Phillipsburg, N. J.
Logansport Machine Co., Inc., 810 Center
Ave., Logansport, Ind.
Onsrud Machine Works Inc., 3940 Palmer St.,
Chicago, III.

POLISHING LATHES AND MACHINES

Gardner Machine Co., 414 E. Gardner St., Beloit, Wis. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Millers Falls Co., Greenfield, Mass. Standard Electrical Tool Co., 2473 90 River Rd., Cincinnati, Ohio. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III.

POLISHING TOOLS, Portable

Sundstrand Machine Tool Co., 2531 11th St., Rockford, III. Thor Power Tool Co., Aurora, Illinois

POWER UNITS, Hydraulic

See Hydraulic Power Units or Tool Heads

PRESSES, Arbor

Baldwin-Lima-Hamilton Co.p., Eddystone Div., Philadelphia 42, Pa. Dake Corp., 604 Seventh St., Grand Haven, Mich.

Mich.

duMont Corp., Greenfield, Mass.

Hannifin Corp., 501 S. Wolf Rd., Des Plaines,

III. III.
Logansport Machine Co., Inc., 810 Center
Ave., Logansport, Ind.
Threadwell Tap & Die Co., Greenfield, Mass.
Tomkins-Johnson Co., 614 No. Mechanic St.,
Jackson, Mich.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich. Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
Dake Corp., 604 Seventh St., Grand Haven, (Continued on page 316)

Another of the Reasons Behind Brad Foote Quality-

• 99% of gear drawings do not specify tooth spacing. For most applications, industry generally believes that competent gear manufacturers, working by standard AGMA practices, will produce gears within the limitations required for easy assembly and good load transmission.

· Occasionally, however, on very precise jobs you may find it necessary to specify extreme accuracy of tooth spacing and nonadjacent tooth spacing. Applications such as radar mounts, timing mechanisms, indexing mechanisms—all may require closer tooth spacing tolerances than are obtainable with average equipment in the hands of regular gear manufacturers.

• BRAD FOOTE welcomes precision jobs like these. We can add to highly specialized equipment specific experience in meeting this, as well as many other demanding requirements for special gear production.

· Prove to yourselves the savings that BRAD FOOTE quality can mean. Let us quote on the gear requirements for your next program. BRAD FOOTE MAKES ALL TYPES OF GEARS-





BRAD FOOTE GEAR WORKS, INC.

Bishop 2-1070 - Olympic 2-7700 - TWX CIC-2856-U AMERICAN GEAR & MFG. CO.

PITTSBURGH GEAR COMPANY
Lamont Blook Phone Lamont 920
Fhone Sholding 1-4600 Puriburgh 25, Penn



FARQUHAR PRODUCTION PRESSES



Figures don't lie when they show you why and how Farquhar Production Presses save money.

It's as easy as this . . . when you want to form material, check with the Farquhar Press Engineer. He'll show you, in plain dollars and cents, how standard Farquhar Production Presses can do your particular job easily, quickly, and at lower cost.

Every Farquhar Production Press has these value-packed advantages . . .

- Rapid advance and return of the ram-for highest production.
- Extra-long guides on the moving platen-for greatest accuracy.
 - Finger-tip controls—for easy, smooth operation.
 - Positive application of speed and pressure on the die for longer press and die life.
 - Minimum maintenance . . . dependable service.

Get the facts on Farquhar Production Presses...send for catalog describing the basic sizes and types of Farquhar Presses. Write: A. B. Farquhar Division, The Oliver Corporation, Press Dept., York 41, Penna.



OLIVER

FARQUITAR YORK PA

FARQUHAR

PRODUCTION PRESSES

DRAWING . FORMING . FORGING . STRAIGHTENING . BENDING . FORCING . ASSEMBLING . EXTRUDING . AND OTHER OPERATIONS

Ferracute Machine Co., Bridgeton, N. J. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. Lake Erle Engrg. Co., Kenmore Station, Buf-falo, N. Y. Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.

PRESSES, Extrusion

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati. Bliss Co., E. W., 1375 Raff Rd., S. W., Can-ton, Ohio. Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio,
Chambersburg, Engr., Co., Chambersburg, Pa.
Erie Foundry Co., Erie, Pa.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York,
N. Y.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Verson Alisteel Press Co., 93rd St., & S. Kenwood Ave., Chicago, Ill.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.

PRESSES, Forging

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engra. Div.,
Paddock Rd., and Tennessee Ave., Cincinnatti, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton,
Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc.,
6499 W. 65th St., Chicago, Ill.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Dake Corp., 604 Seventh St., Grand Haven,
Fish Coundry Co., Erie, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.
Loke Erie Engrg. Corp., Kenmore Station, Buffgla. N. PRESSES, Forging N. Y. Lake Erie Engrg. Corp., Kenmore Station, Buf-falo, N. Y. National Mchy. Co., Greenfield and Stanton Sts., Tiffin, Ohio.

Niagara Macnine & Fcol Works, 683 Northland Ave., Buffalo, N. Y. Verson Allsteel Press Co., 93rd St., and S. Ken-wood Ave., Chicago, III. Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Hydraulic

PRESSES, Hydraulic
American Brooch & Mch. Ce., Ann Arbor,
Mich.
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros., Mfg. Co., 1910 Kishwaukee St.,
Rockford, III.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro,
Pa.,
Biss Co., E. W., 1375 Raff Rd., S. W., Canton,
Ohio.
Chambersburg, Engrg. Co., Chambersburg, Pa. Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Milling Mch. Co., Oakley, CincinCincinnati Milling Mch. Co. (Hydroform), CinCincinnati 9, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc.,
6499 W. 65th St., Chicago, Ill.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta, Defroit 13, Mich.
Dake Corp., 604 Seventh St., Grand Haven,
Mich. Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio. 16, Ohio.
Detroit Broach Co., (special & Semi-special)
P. O. Box 156, Rochester, Mich.
Erie Foundry Co., Erie, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Mch. & Welder Co., Warren, Ohio.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, rannitin Corp., 501 S. Wolf Rd., Des Plaines, III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York I, N. Yess, Inc., 350 Fifth Ave., New York I, N. Yess, Inc., 350 Fifth Ave., New York I, N. Yess, Inc., 200 Fifth Ave., Suffalo, N. Y. Lapointe Machine Tool Co., 34 Tower St., Ludson, Mass.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y., 920 Steiner Ave., Kenton, Ohio Zersen Allsteel Co., 93rd St. and S. Kenwood Ave., Chicago, III.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y. Young Mch Tool Div., Church Rd., Bridgeport, Pa. PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio. Dake Corp., 604 Seventh St., Grand Haven Mich. Ferracute Machine Co., Bridgeton, N. J. Niggara Machine & Tool Works, 683 North-land Ave., Buffalo, N. Y.

PRESSES, Sheet Metal Working PRESSES, Sheet Metal Working
Allen, Alva F., Box 426, Clinton, Mo. (Bench)
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philidat-laid 42 Da. Philadelphia 42, Pa. iss Co., E. W., 1375 Raff Rd., S. W., Canton, Bliss C. Ohio. Briss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa. Cincinnati Milling Mch. Co., Oakley, Cincinnati Milling Mch. Co., Oakley, Cincinnati Ohio.
Cincinnati Milling Mch. Co., (Hydroform), Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Mch. Corp., Div. U. S. Industries, Inc., 6499 W. 65th St., Chicago, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Korchester, N. Y. Dake Corp., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd
Ave., Chicago So, Ill.
Drais & Krump Mfg. Co., 7416 Loomis Blvd., Strie Foundary, Philidalphia, Pa.
Espen-Laca Machine Works, Front St., and Girard Aves., Philidalphia, Pa.
Formon Machine Co., 3134 Sheridon Rd., Kenosha, Wis.
Federal Machine & Welder Co., Overland Ave., Warren, Ohio.
Ferracute Machine Co., Bridgeton, N. J.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buf-falo., N. Y. N. Y. Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y. Lake Erie Engra. Corp., Kenmore Station, Burfalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Verson Altsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PRESSES, Straightening

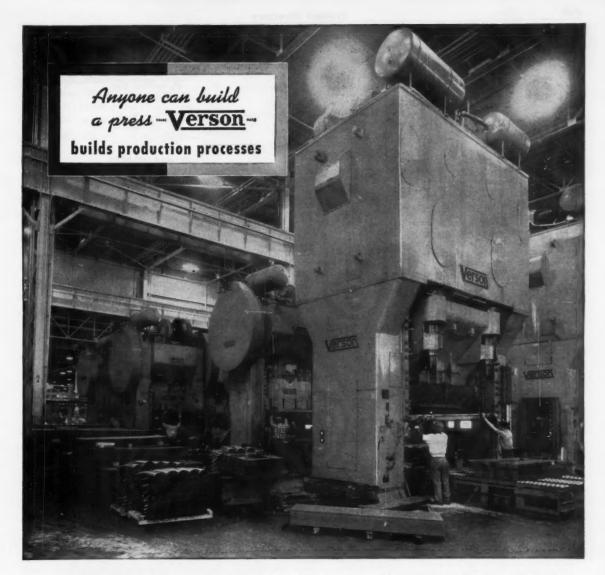
PRESSES, Straightening
American Steel Foundries, Elmes Engrg. Div.,
Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St.,
Rockford, Iil.
Baldwin-Lima-Hamilton Corp., Eddystone Div.,
Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P. O. Box 37,
Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Corp., 604 Seventh St., Grand Haven,
Mich. Erie Foundry Co., Erie, Pa. Hannifin Corp., 501 S. Wolf Rd., Des Plaines, Huraulic Press Mfg, Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave, New York I, N. Y. Niogara Maehine & Tool Works (Hydraulic), 683 Northland Ave., Buffolo, N. Y. Philips & Davies, Inc., 920 Steiner Ave., Kenton, Ohio Springfield Mch. Tool Co., Springfield, Ohio. Verson Allsteel Press Co., 93rd St. & Kenwood Ave., Chicago, III. Wilson, K. R., Inc., 211 Mill St., Arcade, N. Y.

PROFILING MACHINES

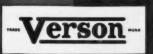
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles 58, Cal. (Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. Col. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George Machine Co., 1110 W. 13th St., Racine, Wis.
Onsrud Machine Works, Inc., 3940 Paimer St., Chicago, III.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

(Continued on page 318)





2500 ton DOUBLE ACTION PRESSES ... key units in this 100%



press room

In the plant in which this photograph was made, 47 Verson presses are now in service and preparations are being made for seven more . . . a 100% Verson-equipped pro-

duction process!

Building production processes is Verson's business. Anyone can build a press . . . it's what that press can be made to do as a part of an integrated process that is important. In over thirty years Verson has produced processes incorporating virtually all types of standard and special presses. All of this experience and know-how

goes into every press that Verson builds.

Whatever your production problems, if they involve the press forming of metals, bring them to Verson. Here your press requirements will be treated as an integrated part of your whole production process. As a manufacturer of practically every type of press we can recommend, without prejudice, the combination of machines that will best fit your over-all requirements.

To put these facilities to work for you, just send an outline of your needs.

VERSON ALLSTEEL PRESS CO.

9309 S. Kenwood Ave., Chicago 19, Illinois . South Lamor at Ledbetter Drive, Dallas, Texas MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES . TOOLING . CUSHIONS . VERSON-WHEELON DIRECT ACTING HYDRAULIC PRESSES



John Ruskin knew what he was talking about when he wrote: "There is hardly anything in the world that some man cannot make a little worse and sell a little cheaper, and the people who consider price only are his prey." Just as this applies to ice cream or magnetos or wool socks, so does it apply to gears.

This "cheap price" paid for a necessarily cheap product may not prove to be such a bargain if the ultimate cost of using such a product can be determined. In the case of gears, each of the following points directly affects final cost: 1. The "price tag" on the gear itself. 2. Extra assembly time wasted in fitting and salvaging "off color" gears. 3. Lack of reasonable service life. 4. Excessive noise. The first point is obvious, and the second becomes so upon observation: for not until the gears have been assembled, "run off," and passed by inspection can the direct cost of the gears be determined. Often part or all of the potential savings on "price" are lost (often without even being recognized) on the assembly floor. Points three and four represent more insidious and hard-to-measure costs-but costs that can be even more damaging, for they will be measured by your customer, and can easily spell the difference between repeat orders or a customer lost for good.

Thus the ultimate cost of a gear that appears to be a bargain may, in the final analysis, actually be exhorbitant. That's why it can pay you to buy good gears, custom made for your specific application—gears made by The Cincinnati Gear Company.

THE CINCINNATI GEAR CO.

CINCINNATI 27, OHIO

"Gears - Good Gears Only"



PULLEYS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

PULLEYS, Friction Clutch

Brown & Sharpe Mfg. Co., Providence, R. I.

PUMPS, Coolant, Lubricant and Oil

Brown & Sharpe Mfg. Co., Providence, R. I. Gray-Mills Co., 1948-52 Ridge Ave., Evanston, III.

All Indian Co., Phillipsburg, N. J. Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind. Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio. Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J. South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind. Tomkins-Johnson Co., Jackson, Mich. Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich. Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-

Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engrg. Co., Chambersburg, Pa.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio. Denison Engrg. Co., Chambersburg, Pa. 16, Ohio. Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydraulic Press Mfg. Co., Mount Gilead, Ohio Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass. Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.

Wis. Sier-Bath Geor & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J. Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich. Viking Pump Co., Cedar Falls, Iowa.

PUMPS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J.

PUMPS, Rotary

Brown & Sharp Mfg. Co., Providence, R. I. Sier-Bath Gear & Pump Co., 9248 Hudson Blvd., North Bergen, N. J. Sundstrand Machine Tool Co., 2531 11th St., Rockford, III. Vickers Incorporated, Division of Sperry Rand Corp., 1402 Oakman Blvd., Detroit, Mich. Viking Pump Co., Cedar Falls, Iowa.

PUNCHES AND DIES

See Dies, Sheet Metal, Etc.

PUNCHES, Centering

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

PUNCHING MACHINERY

Allen, Alva F., Box 426, Clinton, Mo. Buffalo Forge Co., 490 Broadway, Buffalo,

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Engineering & Research Corp., Riverdale, Md.
Famco Machine Co., 3134 Sheridan Rd., Kenosho, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.
Niagara Mch. & Tool Works, 683 Northland

111.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Ryerson, Joseph T., & Son Inc., 2558 W. 16th St., Chicago 18, III.
Verson Alisteel Press Co. 93rd St. & S. Kenwood Ave., Chicago, III.
Wales-Strippet Corp., North Tonawanda, N. Y.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

RACKS, Gear Cut
Boston Gear Works, 3200 Main St., North
Quincy 71, Mass.
Brown & Sharp Mfg. Co., Providence, R. I.
Gear Specialties, Inc., 2635 W. Medill Ave.,
Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead
St., Hartford, Conn.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Massachusetts Gear & Tool Co., 36 Nassau St.,
Woburn, Mass.
Philadelphia Gear Works, Inc., Erie Ave. and
G St., Philadelphia, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave.,
Cleveland 14, Ohio.

REAMER HOLDERS

Lipe-Rollway Corp., 806 Emerson Ave., Syro-cuse, N., Sesley-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Scully-Jones & Co., 1903 Rockwell St., Chicago 8, 11. Warner & Swasey Co., 8701 Carnegie Ave., Cleveland 3, Ohio.

REAMERS

REAMERS

Ace Drill Corp., Adrian, Michigan.
The Atrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 27, Mich. Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
DoAlt Co., 254 N. Laurel Ave., Des Plaines, Ill. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. Pirth Sterling, Inc., 3113 Forbes St., Pitts-burgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass. Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Arvis Corp., Middletown, Conn.
Lipe-Rolloway Corp., 806 Emerson Ave., Syrocuse, N. Y.
Mohawk Tools, Inc., 910 E. Main St., Montpeller, Ohio.
National Twist Drill & Tool Co., & Winter Bros. Co., Rochester, Mich.
Praft & Whitney, West Hartford I Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicogo 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Toft-Peace Mfg. Co., Woonsocket R. I.

cogo 8, III.
Super Tool Co., 21650 Hoovel Roy,
Mich.
Tott-Peirce Mrg. Co., Woonsocket R. I.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1 Mich.

REAMERS, Adjustable

Barber-Colman Co., Rock and Montague, Rock-ford, III. ford, III. Besly-Welles Corp., 112 Dearborn Ave., Beloit,

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Carboloy Dept., General Electric Co. Box 237, Roosevelt Park Annex, Detroit 32, Mich. Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling, Inc., 3113 Forbes St. Pitts-burgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass. McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Pratt & Whitney West Hartford 1, Conn. Taft-Peirce Mfg. Co., Woonsocket, R. I. Union Twist Drill Co., Athol, Mass. Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd. Plymouth, Mich.

REAMERS, Taper Pin

The Atrax Co. (Carbide), 240 Day St., Newington 11, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland 14, Ohio
Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowac, Wis.
Lipe-Rollway, Corp., 806 Emerson Ave., Syracuse, N. Y.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Plymouth, West Hartford 1, Conn
Union Twist Drill Co., Athol, Mass.
Whitman, & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
(Continued on page 320)



NEW DEPARTURE . DIVISION OF GENERAL MOTORS CORPORATION . BRISTOL, CONN.

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-319

NEW DEPARTURE SEALED BEARINGS!



You can drill more holes at LOWER COST with

DRILLS

For fast, efficient, low-cost drilling of hardened steel and abrasive non-ferrous materials, you can't beat an Ace Carbide Drill! How so? Well, one good reason is that Ace drills have polished flutes . . . an outstanding characteristic of drills produced by the Ace-originated "Ground-from-the-Solid" process. And polished flutes mean keener, stronger cutting edges, finer accuracy, greater resistance to wear, lower drilling costs. So whether your application calls for a carbide tipped drill, or one that's solid carbide, make sure you use an Ace! Call your local distributor . . . or send for complete information today!

	CORPORATION
Adrian, Mic	chigan
containing compi	see send me your Catalog No. 52-D ate information on ACE "Ground-from- and hardened H.S.S. drill blanks.
NAME	
COMPANY	
ADDRESS	



REAMING MACHINES

Barnes Drill Co., 814 Chestnut St., Rockford, Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Greaves Machine Tool Co., 2009 Eastern
Avenue, Cincinnati, Ohio.
Hartford Special Machinery Co., 287 Homestead Ave., Hartford 12, Conn.
Kaufman Manufacturing Co., Manitowac, Wis.
Michigan Drill Head Co., Detroit 34, Mich.
Praft & Whitney, West Hartford 1, Conn.
Van Norman Co., 3640 Main St., Springfield 7,
Mass.

RECORDING INSTRUMENTS

National Acme Co. (for counting), 170 E. 131st St., Cleveland, Ohio. Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

REELS, Stock, Standard and Automatic U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

REFRACTORS, Heat-Treating Furnace

Norton Co., 1 New Bond St., Worcester 6, Mass.

REGULATORS, Temperature

General Electric Co., Schenectady, N. Y.

REMOVERS, Japan, Enamel, Etc.

Oakite Products, Inc., 19 Rector St., New York,

RETAINING RINGS FOR BEARINGS, Etc.

Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Waldes-Kohinoor, Inc., 4716 Austel Place,
Long Island City 1, N. Y.

RHEOSTATS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis. General Electric Co., Schenectady, N. Y.

Bethlehem Steel Co., Bethlehem, Pa. Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.

RIVETERS, Hydraulic

Bethlehem Steel Co., Bethlehem, Pa. Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Hannitin Corp., 501 S. Wolf Rd., Des Plaines, III.

RIVETERS, Pneumatic

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Grant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn.
Ingersoll-Rand Co., Phillipsburg, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Thor Power Tool Co., Aurora, Illinois
Wood & Co., R. D. Public Ledger Bldg., Philadelphia, Pa.

RIVETING MACHINES

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y. arant Mfg. & Machine Co., 90 Silliman St., Bridgeport 5, Conn. annifin Corp., 501 S. Wolf Rd., Des Plaines, III. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Tomkins-Johnson Co., Jackson, Mich.

RIVET MAKING MACHINES

Hill Acme Co., 1201 W. 65th St., Cleveland 2, National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

RUBBER PRODUCTS

Garlock Packing Co., Palmyra, N. Y.

RULES, Steel

Brown & Sharpe Mfg. Co., Providence, R. I. Lufkin Rule Co., Hess Ave., Soginaw, Mich. Millers Falls Co., Greenfield, Mass. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y., Starrett, The L. S. Co., Athol, Mass.

RUST PREVENTIVES

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa. Oakite Products, Inc., 19 Rector St., New York, N. Y. Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAND BLAST EQUIPMENT

See Blast Cleaning Equipment

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y. Ingersoll-Rand Co., Phillipsburg, N. J., Mattison Machine Works, Rockford, III. Millers Falls Co., Greenfield, Moss., Sundstrand Machine Tool Co., 2531 11th St., Rockford, III. Thor Power Tool Co., Aurora, Illinois

SAW BLADES, Hack

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Millers Falls Co., Greenfield, Mass.
Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.
Starrett, The L. S. Co., Athol, Mass.

SAW SHARPENING MACHINES

Espen-Lucas Machine Works., Front St. and Girard Ave., Philadelphia, Pa. Motch & Merryweather Machy Co., Penton Bldg., Cleveland, Ohio. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

SAWING MACHINES, Circular

Consolidated Mch Tool Corp., Rochester, N. Y. Cosa Corp., 405 Lexington Ave., New York 17, N. Y. N. Y.
Delto Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry Co., Penton
Bldg., Cleveland, Ohio.
Triplex Machine Tool Corp., 75 West St., New
York 6, N. Y.
Wallace Tube Co., (Abrasive) 1304-08 Diversy
Pkwy., Chicago 14, Ill.

SAWING MACHINES, Friction

DoAll Co., 254 Laurel Ave., Des Plaines, III. Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

SAWING MACHINES, Metal Cutting

Band
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, III.
DoAll Co., 254 Laurel Ave., Des Plaines, III.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosho, Wis.
Kyerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Walker-Turner Div., Kearney & Trecker Corp.,
South Ave., Plainfield, N. J.

SAWING MACHINES, Power Hack

Armstrong-Blum Mig. Co., 5700 W. Blooming-dole Ave., Chicago, Ill.
Austin Industrial Corp., 76 Marnaroneck Ave.,
White Plains, N. Y.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.

SAWS, Circular Metal Cutting

SAWS, Circular Metal Cutting
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
Consolidated Mch. Tool Corp., Rochester, N. Y.
DoAil Co., 254 Laurel Ave., Des Plaines, Ill.
Espen-Lucas Machine Works, Front St. and
Girard Ave., Philadelphia, Pa.
Motch & Merryweather Mchry Co., Penton
Bldg., Cleveland, Ohio.
National Twist Drill & Tool Co., & Winter
Bros., & Co., Rochester, Mich.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Triplex Machine Tool Corp., 75 West St., New
Yark 6, N. Y.
Union Twist Drill Co., Athol, Mass.
(Continued on page 322) (Continued on page 322)



YOU NEVER DREAMED **STAMPED** GEARS COULD BE SO **UNIFORMLY** ACCURATE!



FREE STAMPED GEAR GUIDE!

SEND TODAY for useful 4-page folder. a valuable guide to all that is best in the mass production and use of low cost Stamped Gears, Tools and Assembles. Many various types are described Also contains technical data, tables, ideas, suggestions. Use company stationery, please!

Whether your needs are numbered in hundreds or thousands you can depend upon each WINZELER Stamped Gear to meet exacting specifications! That means BIG savings in assembly downtime.. BIG increases in production. And even more important, it means a sweeter, quieter, smoother running mechanism.. products that give greater service and satisfaction.

WINZELER Stamped Gears are being used by more and more critical, cost-conscious manufacturers from coast-to-coast. They are stamped in production runs from any material. Custom dies are made in a range of sizes from 8 to 96 dp and from .006 to $\frac{3}{16}$ " thickness. Stock dies are available for practically every purpose. Send along your drawings or specifications. Let our capable staff suggest an accurate, economical WINZELER Stamped Gear for the job. Write today.



WINZELER MANUFACTURING & TOOL CO.

1712 WEST ARCADE PLACE . CHICAGO 12, ILLINOIS

SAWS, Metal Cutting Band

Armstrong-Blum Mfg. Co., 5700 W. Blooming-dale Ave., Chicago, III.
DoAII Co., 254 Laurel Ave., Des Plaines, III.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitch-burg, Mass.
Starrett, The L. S., Co., Athol, Mass.

SAWS, Portable Electric

Millers Falls Co., Greenfield, Mass. Thar Power Tool Co., Aurora, Illinois

SAWS, Screw Slotting

Barber-Colman Co., Rock and Montague, Rock-ford, III. ford, III.
Brown & Sharpe Mfg. Co., Providence, R. I.
Circular Tool Co., Inc., 765 Allens Ave., Providence 5, R. I.
National Twist Drill & Tool Co., & Winter Bros.
Co., Rochester, Mich.
Simonds Sow & Steel Co., 470 Main St., Fitchburg, Mass.
Starrett, The L. S., Co., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

SCRAPERS, Hand and Power

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

SCREW DRIVERS, Power
Chicago Pneumatic Tool Co., 6 E. 44th St.,
New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Thor Power Tool Co., Aurora, Illinois

SCREW DRIVING AND NUT SETTING EQUIPMENT

Errington Mechanical Laboratory, Inc., 24 Nor-wood Ave., Stapleton, S. I., N. Y. Ingersoll-Rand Co., Phillipsburg, N. J. Thor Power Tool Co., Aurora, Illinois

SCREW MACHINE TOOLS AND EQUIPMENT

AND EQUIPMENT

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.

Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech
St., Cincinnati 12, Ohio.

Colonial Broach & Machine Co., P.O. Box 37,
Harper Sta., Detroit 13, Mich.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, Ill.

Millers Falls Co., Greenfield, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.

New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn.
Otter & Johnson Co., 1027 Newport Ave.,
Pawtucket, R. I.
R and L Tools, 1825 Bristol St., Philadelphia
40, Pa.
Reed Rolled Thread Die Co., P.O. Box 350.

Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

SCREW MACHINE WORK

SCREW MACHINE WORK
Cleveland Automatic Machine Co., 4932 Beech
St., Cincinnati 12, Ohio.
Estern Mch. Screw Corp., New Haven, Conn.
Mueller Brass Co., Port Huron 35, Mich.
National Acme Co., 170 E. 131s 51, Cleveland, Ohio.
Ottemiller, M. H., Co., York, Pa.
Standard Pressed Steel Co., Jenkintown, Pa.
Wicaco Mch. Corp., Wayne Junction, Philadelphia, Pa.

SCREW MACHINES, Automatic Single and Multiple Spindle

Single and Multiple Spindle
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Machine Co., 4932 Beech
St., Cincinnati 12, Ohio.
Cone Automatic Mach. Co., Inc., Windsor, Vt,
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Gorton, George, Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Greenlee Bros. & Co., 12th and Columbia
Aves., Rockford, III.
National Acme Co., 170 E. 131st St., Clevelond, Ohio.
New Britain Mch. Co., New Britain-Gridley
Mch. Div., New Britain, Conn.
Orbon, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Scherr, George Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Warner & Swasey Co., 5701 Carnegie Ave.,
Cleveland 3, Ohio.

SCREW MACHINES, Hand

See also Lathes, Turret
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Hardinge Bros., Inc., 1418 College Ave.,
Elmira, N. Y.
Orban, Kurt Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass. City 3, N. J.
Rivert Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Warner & Swasey Co., 5701 Carnegle Ave., Cleveland 3, Ohio.

SCREW PLATES

Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass. Greenfield Tap & Die Corp., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Threadwell Tap & Die Co., Greenfield, Mass. Winter Bros. Co., Rochester, Mich.

SCREWS, Cap, Set, Safety Set and Machine, Etc.

Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn. Conn.
Chicago Screw Co., Bellwood, III.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Ottemiller, W. H., Co., York, Pa.
Parker-Kalon Div., General American Transportation Corp., 200 Varick St., New York, N. Y. N. Y. Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y. Standard Pressed Steel Co., Jenkintown, Pa.

SCREWS, Self-Tapping, Drive

Parker-Kalon Div., General American Trans-portation Corp., 200 Varick St., New York, N. Y.

SCREWS, Thumb

Parker-Kalon Div., General American Trans-portation Corp., 200 Varick St., New York, portarion Corp., 200 Varick St., New York, N. Y. Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SEALS AND RETAINERS, Oil or Grease Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago 22, III. Crane Packing Co., 1800 Cuyler Ave., Chicago, III. Garlock Packing Co., Palmyra, N. Y.

SECOND-HAND MACHINERY, Etc.

Eastern Machinery Co., 1006 Tennessee Ave., Cincinnati 22, Ohio. Miles Machinery Co., Box 770, Saginaw, Mich.

SEPARATORS, Centrifugal

De Laval Separator Co., Poughkeepsie, N. Y.

SEPARATORS, Oil or Coolant

Barnes Drill Co. (Magnetic), 814 Chestnut, Rockford, III. National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

SHAFTING, Steel

Bethlehem Steel Co., Bethlehem, Pa. Cumberland Steel Co., Cumberland, Md. De Laval Separator Co., Poughkeepsie, N. Y. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

SHAFTS

Jarvis Corp., Middletown Conn. National Forge & Ordnance Co., Irvine, Warren County, Pa. Standard Pressed Steel Co., Jenkintown, Pa.

SHAFTS, Hollow-Bored Bethlehem Steel Co., Bethlehem, Pa. SHAFTS, Turned and Ground

Bethlehem Steel Co., Bethlehem, Pa. Cumberland Steel Co., Cumberland, Md. National Forge & Ordnance Co., Irvine, Warren County, Pa. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.

SHAPER-PLANERS

Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, III. Young Mch. Tool Div., Church Rd., Bridgeport, Pa.

SHAPERS

SHAFES

American Tool Works Co., Pearl and Eggleston
Ave., Cincinnati, Ohio.
Atlas Press Co., Kalamazoo, Mich.
Austin Industrial Corp., 76 Mamaroneck Ave.,
White Plains, N. Y.
Barber-Colman Co. (Hendey Mch. Div.) Rockford III Barber-Colman Co. (Hendey Mch. Div.) Rockford, Ill.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicago, Ill.
Orban, Kurt, Co., Inc., 34 Exchange Pl., Jersey
City 3, N. J. Tool Co., 2500 Kishwaukee St.,
Rockford, Ill.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox
Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

SHAPERS, Vertical

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y. Pratt & Whitney, West Hartford 1, Conn. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

SHAPERS, Structural

Bethlehem Steel Co., Bethlehem, Pa. U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEARING MACHINERY

Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
III. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y. N. Y.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.
Verson Allstee Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.
Yoder Co., 550 Walworth Ave., Cleveland,
Ohio.

SHEARS, Alligator

Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Hydropress, Inc., 350 Fifth Ave., New York 1, N. Y.

SHEARS, Rotary

SHEARS, Rotary
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Niagara Mch. & Tool Works, 683 Northland
Ave., Buffalo, N. Y.
Hydropress, Inc., 350 Fifth Ave., New York 1.
N. Y.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
Simonds Saw & Steel Co. (Knives), 470 Main
St., Fitchburg, Mass.
Union Twist Drill Co., Athol, Mass.

(Continued on page 324)



9" column 3'-4' arms



9"-11" column 3'-4'-5' arms



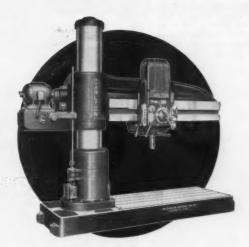
13"-15"-17" column 4'-5'-6'-7' arms



19" column 6'-7'-8' arms



22"-26" column 7' to 12' arms



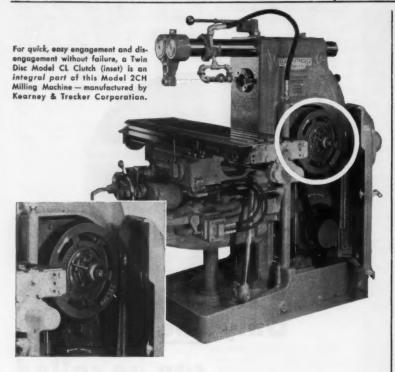
Only <u>one</u> can be called the finest

Only Carlton offers you a choice of three speed-feed controls:

Programming for pre-selecting speeds and feeds for an entire drilling program including as many as 20 or 30 operations. Pre-selector for setting speed and feed for the next operation while machine is still under cut. Manual to take advantage of Carlton's centralized push button control. For futher information, send today for free descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio.



horizontal and radial drills



Twin Disc Clutches used by Kearney & Trecker for 35 years!

Since 1920, Kearney & Trecker Corporation - progressive manufacturer of machine tools-has incorporated Twin Disc Friction Clutches in many of its models.

A typical example is the Model 2CH Milling Machine, which is just one of 28 such machines that they manufacture. An integral part of the 2CH is a Twin Disc Model CL Clutch. This clutch provides quick, easy engagement and disengagement without failure - positive control and trouble-free performance. Overall dimensions have been held to a minimum to conserve space. Action parts are hardened and ground, and wide friction surfaces are used. High grade

molded asbestos friction material and highly finished surfaces on the clutch plates reduce wear and assure smooth, efficient operation.

Specify Twin Disc Clutches for your equipment . . . as Kearney & Trecker has done so satisfactorily for the past 35 years! Write now to Twin Disc Clutch Company, Racine, Wis. Request Bulletin 120-D.



TWIN DISC CLUTCH COMPANY, Racine, Wisconsin . aronaulis Division, Racatere, Illinois nches or Sales Engineering Offices: Cleveland . Ballas . Detroit . Les Angeles . Hewark . New Orieans . Tulsa

SHEARS, Squaring

Cincinnati, Shaper Co., Elam and Garrard Aves.,
Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St.
Clair Ave., N. E. Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Famco Machine Co., 3134 Sheridan Rd.,
Kenosha, Wis. Famco Machine Co., 3134 Sheridan Rd., Kenosho, Wis. Hamilton Div. of the Lodge & Shipley Co., Hamilton 1, Ohio. Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y. Simonds, Saw & Steel Co. (Blades), 470 Main St., Fitchburg, Mass. Verson Altsteel Press Co., wood Ave., Chicago, Ill.

SHEET METALS

American Brass Co., 25 Broadway, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
New Jersey Zinc Co., 160 Front St., New York, N. Y. N. Y. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill. U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div. Columbia Steel Co., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHEET METAL MACHINES, Shrinking, Stretching, Forming & Flanging.

Engineering & Research Corp., Riverdale, Md.

SHEETS, Iron and Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. Bethiehem Steel Co., Bethiehem, Pa. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

SHIMS

Laminated Shim Co., Inc., Glenbrook, Conn.

SLEEVES

Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Wis.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
National Twist Drill & Tool Co., Rochester,
Alicham Scully-Jones & Co., 1903 Rocking, 8, Ill. Union Twist Drill Co., Athol, Mass.

SLOTTING MACHINES

Baker Bros., Inc., Station F, P.O. Box 101, Toledo 10, Ohio. Consolidated Mch. Tool Corp., Rochester, N. Y. Lobdell United Div., United Engrg. & Foundry Co., Wilmington 99, Del. Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.

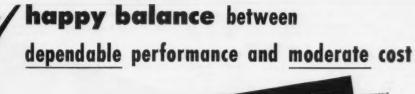
SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Besty-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Bessy-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Chicago-Latrobe Twist Drill Wks., 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Praft & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

SPECIAL MACHINERY AND TOOLS

American Steel Foundries, Elmes Engrg, Div., Poddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Axelson Mfg. Co., 6160 S. Boyle Ave., Los Angeles S8, Cal.
Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Saldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Baldwin-Lima-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio.

(Continued on page 326) (Continued on page 326)



ROLLWAY
STEEL CAGE
ROLLER BEARINGS

Tru-Rol precision, steel-cage, beavy-duty bearing with contoured guide lips assuring true right-line rolling, maintained roller alignment and thin oil film.

• Rollway's TRU-ROL Steel-Cage Bearings afford wide latitude in balancing dependable performance, long life, and bigb load capacity against moderate cost. They rate high in any comparison on a costperformance basis.

A choice of stamped steel retainers with contoured guide lips, or steel segmented retainers assure true rolling and an evenly distributed thin oil film—big factors in reducing power losses and heating.

"Crowned" Rollers Relieve End Stress

TRU-ROL offers the extra advantage of a finish-ground "crown" radius on the roller ends. That relieves high endstress and insures uniform load distribution over the entire length of the roller. The result: TRU-ROL Steel Cage Bearings carry heavier loads over longer periods without excessive end-fatigue. They are less affected by slight misalignment or shaft deflection.

Investigate TRU-ROL Steel Cage Roller Bearings before selecting any bearing in the medium price range.



FREE



♠ Rollway Metric Series Steel-Cage Bearings offer the greater load capacity of solid cylindrical rollers. plus the true right-line rolling of trunnion rollers turning in a rigid steel cage. There's no roller skew, no pinch out, no cam action. Design permits maximum bearing capacity . . . within small space . . . at

TYPE D

Rollway

Metric Series

Roller Bearings

Steel Cage

ROLLWAY BEARINGS

COMPLETE LINE OF RADIAL AND THRUST CYLINDRICAL ROLLER BEARING

ROLLWAY BEARING CO., INC. 551 Seymour St., Syracuse 4, N.Y.

Please send a free copy of New Tru-Rol Catalog with extra Alignment Charts.

No.

Firm Name

City Zone State

ENGINEERING OFFICES: Syracuse • Boston • Chicago • Detroit • Toronte • Pittsburgh • Cleveland • Milwawkes • Seettle • Houston • Philadelphia • Los Angeles • Sen Francisco

For more information fill in page number on Inquiry Card, on page 221

MACHINERY, January, 1956-325

Baker Bros., Inc., Sta. F., P.O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bethlehem Steel Co., Bethlehem, Pa.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Birdsboro Steel Fdy. & Mch. Co., Birdsboro, Pa.
Blanchard Mch. Co., 64 State St., Cambridge, Mass.

Mass. Bliss, E. W. Co., 1375 Raff Rd., S. W., Canton, Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.

Mich.

Chambersburg Engrg, Co., Chambersburg, Pa.

Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.

Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.

Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.

Consolidated Mch. Tool Corp., Rochester, N. C.

Coulter, James, Machine Co., Bridgeport 5, Conn.

Cross Co., Detroit, Mich.

Erie Foundry Co., Erie, Pa., Espen-Lucos Mch. Works, Front St. and Girard Ave., Philadelphia, Pa. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.

32, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Federal Machine & Welder Co., Overland Ave.,
Warren, Ohio.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gishalt Machine Co., 1245 F. Workington Ave.

delphia 20, Pa.
Gisholt Machine Co., 1245 E. Washington Ave.,
Madison 10, Wis.
Gorton, Geo., Mch. Co., 1110 W. 13th St.,
Racine, Wis.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Greenlee Bros. & Co., 12th and Columbia
Aves, Rockford, Ill.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill.

Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio. Ohio.

Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York,
N. Y.

Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, III.

Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.
Lake Erie Engrg. Corp., Kenmore Station, Buffolo, N. Y.
Lipe-Railway Corp., 806 Emerson Ave., Syracuse, N. Y.
Mercury Engra. Corp., Milwaukee, Wis.
Michigan Drill Head Co., Detroit 34, Mich.
Michigan Drill Head Co., Detroit 34, Mich.
Michigan Tool Co., 7171 E. McNichols Rd.,
Detroit 12, Mich.
Millholland, W. K. Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Industrial Engrg. Co., 14230 Birwood,
Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Cincinnati 3, Ohio.
Motch & Merryweacher Mchry. Co., Penton
Bidg., Cleveland, Ohio.
National Automatic Tool Co., Inc., 9 7th and
N Sts., Richmond, Ind.
National Broach & Mch. Co., 5600 St. Jean
Ave., Detroit 2, Mich.
National Twist Drill & Tool Co., Rochester,
Mich.
New Britain Mch. Co., New Britain-Gridley

National Twist Drill & Tool Co., Rochester, Mich.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffolo, N. Y.
Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.

Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis.
Philips and Davies, Inc., 920 Steiner Ave., Kenton Chio Tatt & Whitney, West Hartford I, Conn. Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Moss.
Seneca Falls Mch. Co., Seneca Falls, N. Y. Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.
Sundstrand Mch. & Tool Co., 2531 11th St., Rockford, Ill.
Swanson Tool & Machine Products, Inc., 854 E. 8th St., Erie, Pa. Taft-Peirce Mfg. Co., Woonsocket, R. I. Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich. Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich. Verson Allsteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, Ill.
Waltham Machine Works, Newton St., Waltham, Mass.

Wicaco Mch. Corp., Wayne Junction, Philadel-phia, Pa. Zagar Tool Co., 24000 Lakeland Blvd., Cleve-land 23, Ohio.

SPEED REDUCERS

Boston Gear Work, 320 Main St., North Quincy Boston Gear Work, 320 Main St., North Quincy 71, Mass.
Brad Foote Gear Works, 1309 So. Cicero Ave., Chicago 50, III.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears, Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
General Electric Co., Schenectady, N. Y.
Horsburgh & Scott Co., 5114 Hamilton, Cleveland, Ohio.
Oilgaar Co., 1569 W. Pierce St., Milwaukee, Wis.
Philadelphia Gear Works, Inc., Erie Ave. and Wis. niladelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. win Disc Clutch Co., 1361 Racine St., Racine,

SPINDLES, Boring and Milling

Pope Mchry. Corp., Haverhill, Mass. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio.

SPINDLES, Grinding

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich. 32, Mich. Pope Mchry, Corp., Haverhill, Mass. Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati, Ohio. Taft-Peirce Mfg. Co., Woonsocket, R. I.

SPINNING LATHES

See Chucking Machines.

SPROCKET CHAINS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass. Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.

SPROCKETS

Boston Gear Work, 3200 Main St., North Quincy 71, Mass. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa. Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.

STAMPINGS, Sheet Metal

Laminated Shim Co., Inc., Glenbrook, Conn. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y. Winzeler Mfg. & Tool Co., 1712 W. Arcade Pl., Chicago 12, Ill. Chicago

STEEL

STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa. American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co., Reading, Pa. Crucible Steel Co., and America, Oliver Bldg., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. National Forge & Ordnance Co., Irvine, Warren County, Pa. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburgh, Mass.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tenessee Coal, Iron & R. R. Co., Div.), 436 Ave., Pittsburgh, Pa. Wheeler-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Cold Drawn

STEEL, Cold Drawn
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeler Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, III.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co.),
Div., 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, High Speed Tool

STEL, High Speed Tool
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong
Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co., Rending, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa. Pittsburgh 3u Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburgh, Mass.
Vanadium Alloys Steel Co., Latrobe Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa. Carpenter Steel Co., Reading, Pa. Crucible Steel Co. of America, Oliver Bldg., Pittsburgh 30, Pa. Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill., Timken Roller Bearing Co., Canton, Ohio. Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludium Steel Corp., Pltisburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son., Inc., 2558, W. 14th. 30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th
St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div.), 436
7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Adass

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel
Corp., Rackefeler Bldg., Cleveland, Ohlo.
Bethlehem Steel Co., Bethlehem, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co.
Div., Carnegie-Illinois Steel Corp., Div., Columbia Steel Co. Div., Tennessee Coal, Iran
& R. R. Co. Div.), 436 7th Ave., Pittsburgh,
Pa.

STEEL, Tool and Die

STEEL, 1001 and Die
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bidg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys teel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip Allegheny Ludium Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS See Alloys, Steel

STEEL BARS

See Bars, Steel

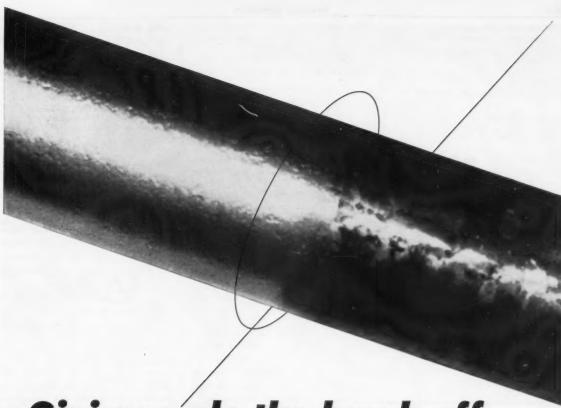
STEEL STOCK GROUND FLAT Brown & Sharpe Mfg. Co., Providence, R. I. Starrett, The L. S., Co., Athol, Mass.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

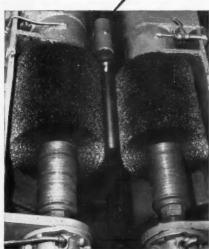
STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Prott & Whitney, West Hartford 1, Conn.
Threadwell Tap & Die Co., Greenfield, Mass. (Continued on page 328)



Giving scale the brush off

Cleveland 14, Ohio.



Automatic Brushing Machine inserts end of tube between brush rolls . . . cleans rotating tube on predetermined cycle . . . stops and ejects tube.

SCALE and hardened preservative oil must be removed from the ends of boiler tubes prior to welding. Automatic Osborn power brushing proved the simplest and most economical cleaning method.

This is typical of the many new—and often unique cleaning and finishing operations being performed in virtually every industry by Osborn Power Brushing Methods.

An Osborn Brushing Analysis, made in your plant, will show how you can improve metal cleaning operations with power brushing. Write The Osborn Manufacturing Company, Dept. D-37, 5401 Hamilton Avenue,

COMPLETE DATA—For information on power brushes and brushing methods, write today for Osborn Catalog 300.





BRUSHING METHODS . POWER, PAINT AND MAINTENANCE BRUSHES BRUSHING MACHINES . FOUNDRY MOLDING MACHINES

STONES, Oil or Sharpening

Carborundum Co., Buffalo Ave., Niagara Falls, N. Y. Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire

Lewis Machine Co., 3441 E. 76th St., Cleveland 27, Ohio Sesco, Inc., 8881 Central, Detroit 4, Mich. U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati,

Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.

Baldwin-Lima-Hamilton Corp., Eddystone Div., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III.

III.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York I,
N. Y.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Philios and Davies. Inc., 920 Steiner Ave. falo, N. Y.
Philips and Davies, Inc., 920 Steiner Ave.,
Kenton, Ohio
Springfield Mch. Tool Co., Springfield, Ohio.
Verson Alisteel Press Co., 93rd St. & S. Kenwood Ave., Chicago, III.

STUD SETTERS

Errington Mechanical Laboratory Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.

SUB-PRESSES

Waltham Machine Works, Newton St., Wal-tham, Mass.

SUPERFINISHING MACHINES

Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE CHECKING EQUIPMENT

Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio,

SURFACE PLATES

See Plates, Surface

SWAGING MACHINES

Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio. Hartford Special Mchry. Co., 287 Homestead Ave., Hartford, Conn.

SWITCHES

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis. General Electric Co., Schenectady, N. Y. National Acme Co., 170 E. 131st St., Cleve-land, Ohio.

TACHOMETERS

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

TANGS, Replaceable, Drill & Reamer Nu-Tangs Inc., 1335 Bates St., Cincinnati, Ohio.

TAPER PINS, Standard

Chicago Screw Co., Bellwood, III. DoAll Co., 254 N. Lourel Ave., Des Plaines, III. Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS

DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Errington Mechanical Laboratory, Inc., 24
Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago
8, III.

TAPPING ATTACHMENTS
AND DEVICES

Avey Drilling Mach. Co., 26 E. Third St., Cov-Avey Drilling much, son, ington, Ky.
Baker Bros., Inc., Station F, P.O. Box 101.
Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
DoAll Co., 254 N. Lourel Ave., Des Plaines, Ill.
Errington Mechanical Laboratory, Inc., 24
Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., BrookIyn, N.Y.
Jarvis Corp., Middletown, Conn.
Leland-Gifford Co., 1425 Southbridge St.,
Worcester, Mass.
Michigan Drill Head Co., Detroit 34, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet
St., Clininati 3, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St.,
Lancaster, Pa.

TAPPING MACHINES

TAPPING MACHINES

Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.

Baker Bros., Inc., Station F, P.O. Box 101,
Toledo 70, Ohio.

Barnes Drill Co., 814 Chestnut, Rockford, III.

Barnes, W. F. & John, Co., 201 S. Water St.,
Rockford, III.

Baush Machine Tool Co., 156 Wasson Ave.,
Springfield 7, Mass.

Bodine Corp., 317 Mt. Grove St., Bridgeport,
Conn.

Buffalo Forge Co., 490 Broadway, Buffalo,
N. Y. Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Challenge Mchry Co., Grand Haven, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia, 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 S. 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis. Ohio.

Kungbury Mch. Tool Corp., Keene, N. H.

Kingsbury Mch. Tool Corp., Keene, N. H.

Leland-Gifford Co., 1025 Southbridge St.,

Worcester, Mass.

Michigan Drill Head Co., Detroit 34, Mich.

Millholland, W. K. Machinery Co., 6402 West
field Blvd., Indianapolis 5, Ind.

Moline Tool Co., 102 20th St., Moline, Ill.

Morris Machine Tool Co., Inc., 946-M Harriet

St., Cicinnati 3, Ohio.

National Acme Co., 170 E. 131st St., Cleve
land, Ohio. National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut

Hill Acme Co., 1201 W. 65th St., Cleveland 2 Onio.

Michigan Drill Head Co., Detroit 34, Mich.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.

TAPS

Besley-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Buttarfield Div., Union Twist Drill Co., Derby Line V., Mfg. Co., Div. Union Twist Drill Co., S. W., Mfg. Co., Div. Union Twist Drill Co., Monsfield, Mos. Co., Monsfield, Mos. Co., Monsfield, Mos. Dotroit 32, Mich., DoAll Co., 254 N. Laurel Ave., Des Plaines, III. Geometric Tool Co., Westville Station, New Hoven 15, Conn. Greenfield Tap & Die Corp., Greenfield, Mass. Jarvis Corp., Middletown, Conn. Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa. Morse Twist Drill & Mch. Co., New Bedford, Mass. Pratt & Whitney, West Hartford 1, Conn. Butterfield Div., Union Twist Drill Co., Derby Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield St., Dayton 1,
Ohio. Threadwell Tap & Die Co., Greenfield, Mass.

TAPS, Collapsing

Geometric Tool Co., Westville Station, New Haven 15, Conn. Landis Mch. Co., Waynesboro, Pa. National Acme Co., 170 E. 131st St., Cleve-land, Ohio. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.

TESTING EQUIPMENT, Tension, Compression, Fatigue, etc.

Olsen Tinius Testing Mch. Co., Willow Grove,

THREAD CUTTING MACHINERY

THREAD CUTTING MACHINERY
Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17,
N. Y.
Coulter, James, Machine Co., Bridgeport 5,
Corn.
Davis & Thompson Co., 6411 W. Burnham St.,
Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vf.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Ohio. Ohio.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Lees-Bradner Co., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St.,
New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, III.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS

Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, III. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis. Besly-Welles Corp., 112 Dearborn Ave., Beloit, Wis.
Eastern Mch. Screw Corp., New Haven, Conn. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Spring-field, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn., Rivett Lothe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield St., Dayton 1, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Ferndale, Mich.
7, N. Y.

THREAD GAGES

See Gages, Thread

THREAD GRINDING MACHINES

See Grinding Machines, Thread

THREAD MILLING MACHINES

Coulter, James, Machine Co., Bridgeport 5, Conn. Lees-Bradner Co., Cleveland, Ohio. Pratt & Whitney, West Hartford 1, Conn. Sheffield Corp., 721 Springfield St., Dayton 1, Ohio. Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING HEADS

National Acme Co., 170 E. 131st St., Cleveland, Ohio.

THREAD ROLLING MACHINES

Landis Machine Co., Waynesboro, Pa. Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn. Reed Rolled Thread Die Co., P.O. Box 350, Worcester 1, Mass.

(Continued on page 330)

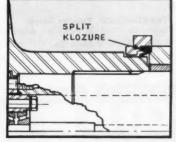


Goodman Mining Machines get positive bearing protection with KLOZURE* OIL SEALS!

The bearings on Goodman Mining Machines are subjected to the most severe service conditions—particularly coal dust and dampness. To provide positive protection for these costly bearings, Goodman engineers use dependable KLOZURE Oil Seals.

Garlock Split-Klozures, which can be installed around the shaft without dismantling the equipment, are used on the main bearing. Standard Model 53 Finger Spring Klozures (not illustrated) are used on the tractor roller bearings.

Let us show you how superior Klozure Oil Seals can solve your sealing problems. Just contact the Garlock office nearest you, or write for Klozure Catalog 10.



Garlock Split-KLOZURE Oil Seal—specifically designed for heavy equipment.

Cross section shows Garlock Split KLOZURE Seal as applied to the rotor assembly (main) bearing of Goodman's Type 401 Miner.

*Registered Trademark

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Sales Offices and Worehouses: Baltimore, Birmingham, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, Los Angeles, New Orleans, New York City, Palmyra (N.Y.), Philadelphia, Pittsburgh, Portland (Oregon), Salt Lake City, San Francisco, St. Louis, Seattle, Spokane, Tulsa.

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.



GARLOCK



A precise balance of toughness, red hardness and wear resistance enables duMont Tool Bits to hold a keener cutting edge longer, gives you more cuts per bit, more cuts per dollar.

Make your own performance tests. You'll see why duMont Tool Bits are the choice of cost-wise buyers everywhere.

	MONT CORPORATION Seld, Massachusetts
	REE Tool Bit COMPARISON , CATALOG and PRICE LIST
Name	00 00 60 10 T 1 200 0 7 7 200 100 0
Company	y
Address	57 1940 00 00 1900 1900 0100 0100 0100 010

TIN AND TERNEPLATES

Bethlehem Steel Co., Bethlehem, Pa. U. S. Steel Corp., (Carnegie-Illinois Steel Corp., Div., Columbia Steel Co., Div., Tennessee Coal, Iron & R.R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel

TOOL BITS, High Speed Steel
Allegheny Ludium Steel Sorp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong
Ave., Chicago, III.
Besly-Welles Corp., III. Dearborn Ave., Beloit,
William Steel Co., Reading, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
du Mont Corp., Greenfield, Mass.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St.,
Chicago 18, III.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge,
Mass.
Whatman & Barnes, 40600 Plymouth Rd.,

& Barnes, 40600 Plymouth Rd.,

Plymouth, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOL BITS, Special Alloy

TOOL BITS, Special Alloy
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
OAII Co., 254 N. Laurel Ave., Des Plaines, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Haynes Stellite Div., Union Carbide & Carbon
Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.,
Vanadium Allays Steel Co., Latrobe, Pa.
Vanadium Allays Steel Co., Latrobe, Pa.
Wesson Co., 1200 Woodward Heights Bivd.,
Ferndale, Mich.

TOOL CONTROLS

Royal Design & Manufacturing, Inc., 4133 E. Ten Mile Rd., Centerline, Mich.

See Grinding Machines for Sharpening, Turning and planing Tools

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit. Mich. chine Tool Co., Fond du Lac, Wis Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich., Portage Double Quick Tool Co., 1063 Sweltzer Ave., Akron 11, Ohio. and L. Tools, 1825 Bristol St., Philadelphia 40, Pd. 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago B, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass. Brown & Sharpe Mfg. Co., Providence, R. I. Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y. Starrett, The L. S., Co., Athol Mass. Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL STEEL

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Oliver Bldg.,
Pittsburgh 30, Pa.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Ryerson, Jos. T., & Son, Inc., 2558 16th St.,
Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

TOOLS, Carbide-Tipped

Ace Drill Corp., Adrian, Michigan.
Allegheny Ludium Steel Corp., Pittsburgh, Pa.
The Atrax Co., (Carbide) 240 Day St., Newington 11, Conn.
Besly-Welles Corp., 112 Dearborn Ave., Beloit,
Wis.
Carboloy Dept., General Electric Co., Box 237,
Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W.
Ontario St., Chicago, III.
Cleveland Twist Drill Co., 1242 E. 49th St.,
Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
DoAll Co., 254 N. Laurel Ave., Des Plaines, III.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
32, Mich.
Firth Stefling Inc., 3113 Forbes St., Pittsburgh
30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio,
National Twist Drill & Tool Co., Rochester,
Mich. Mich.
Newcomer Products, Latrobe, Pa.
Super Tool Co., 21650 Hoover Rd., Detroit 13,
Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd.,
Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd.,
Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor
Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

TOOLS, Lathe, Shaper and Planer

Allegheny Ludium Steel Corp., Pittsburgh, Pa. Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

Bullard Co., Brewster St., Bridgeport 2, Conn.

Carboloy Dept., General Electric Co., Box. 237, Roosevelt Park Annex, Detroit 32, Mich.

du Mont Corp., Greenfield, Mass.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y. Kennametal, Inc., Lathrobe, Pa.

South Bend, Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.

Turchan Follower Machine Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.

Weson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

TRANSFER MACHINES, Automotic

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn. Barnes Drill Co., 814 Chestnut St., Rockford, III. Barnes, W. F. & John, Co., 201 S. Water St., Rockford, III. Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Colonial Broach & Machine Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich. Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Michigan Drill Head Co., Detroit 34, Mich. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed
Oilgear Co., 1569 W. Pierce St., Milwaukee,
Wis. Wis. Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio. Sundstrand Mch. Tool Co., 2531 11th St., Rockford, III.

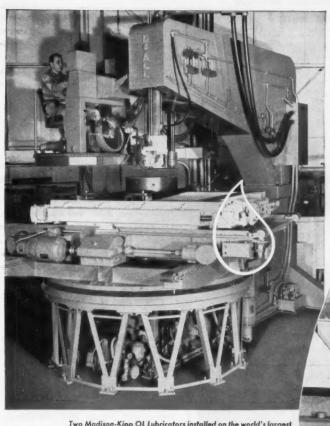
TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridge-port 5. Conn.

TUBE FORMING AND WELDING MACHINES

Federal Machine & Welder Co., Overland Ave., Warren, Ohio. Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

(Continued on page 332)



MACHINES OF GREAT PERFORMANCE USE THE OST DEPENDABLE OILING TEM EVER DEVELOPED

MADISON-KIPP

Lubricators

Two Madison-Kipp OL Lubricators installed on the world's largest band machine and die filer, manufactured by the DoALL Co., Des Plaines, Illinois...Operated by remote control, they machine 10-ton extrusion dies for the Air Force "Heavy Press Program."

Fresh Oil.

MEASURED DROP

...from a Madison-Kipp Lubricator is the most dependable method of lubrication ever developed. It is applied as original equipment on America's finest machine tools, work engines and compressors. You will definitely increase your production potential for years to come by specifying Madison-Kipp on all new machines you buy where oil under pressure fed drop by drop can be installed.



203 WAUBESA STREET . MADISON 10, WIS., U.S.A.

- Skilled in Die Casting Mechanics Experienced in Lubrication Engineering Originators of Really High Speed Air Tools

TUBE MILLS

Abbey-Etna Co., 2444 Maplewood Ave., Toledo 10, Ohio. Yoder Co., 550 Walworth Ave., Cleveland, Ohio.

TUBE TESTING AND EXPANDING MACHINE

Hydropress, Inc., 350 Fifth Ave., New York 1,

TUBING, Brass and Copper

American Brass Co., 25 Broadway, New York, N. Y. Mueller Brass Co., Port Huron 34, Mich. Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

TUBING, Steel

TUBING, Steel

Allegheny Ludium Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
National Tube Div., U. S. Steel Corp., 525 Wm.
Penn Place, Pittsburgh, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St.,
Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS

See Drills, Twist

UNIT HEATERS

L. J. Wing Mfg. Co., Linden, N. J.

UNIVERSAL JOINTS

Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass. Boston Gear Works, 3200 Main St., North Quincy 71, Mass. Gear Grinding Machine Co., 3901 Christopher St., Detroit 11, Mich.

VALVE CONTROLS

Philadelphia Gear Works, (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air

Hannifin Corp., 501 S. Wolf Rd., Des Plaines, III. III.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St.,
Salem, Ohio.
Rivett Lathe & Grinder Inc., Brighton, Boston
35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate,
Detroit, Mich.

VALVES, Hydraulic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincin-nati, Ohio.
Baldwin-Lima-Hamilton Corp., Eddystone Div., Philodelphia 42, Pa.
Barnes, John S., Corp., Rockford, III.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio. Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio. Hannifin Corp., 501 S. Wolf Rd., Des Plaines III. III.
Hunt, C. B., & Son., 1911 E. Pershing St.,
Salem, Ohio.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio
Hydropress, Inc., 350 Fifth Ave., New York 1,
N. Y.

Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind. Oilgear Co., 1569 W. Pierce St., Milwaukee, Wis. Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston
35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St.,
Rockford, Ill.
Turchan Follower Machine Co., 8259 Livernois
& Alaska Aves., Detroit, Mich.
Vickers Incorporated, Division of Sperry Rand
Corp., 1402 Oakman Blvd., Detroit, Mich.

VIBRATION INSULATION

American Felt Co., Glenville, Conn.

VISES, Machine

Armstrong-Blurn Mfg. Co., 5700 W. Blooming-dole Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Oakley, Cincinnati 9, Ohio.
Honnifin Corp., 501 S. Wolf Rd., Des Plaines,
Ill. III.
Logansport Machine Co., Inc., 810 Center
Ave., Logansport, Ind.
Producto Mch. Co., 990
Bridgeport, Com.,
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2,
Mich. Mich.
S. Burke Machine Tool Div., Brotherton Rd.
17, Cincinnati 27, Ohio.

VISES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

VISES, Planer and Shaper

From & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elan and Garrard Aves.,
Cincinnati, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St.,
Rockford, Ill.
Skinner Chuck Co., 344 Church St., New
Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison
St., South Bend, Ind.

VOLTMETERS

General Electric Co., Schenectady, N. Y.

WASHERS, Lock

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E. Massillon, Ohio.

WASHERS, Spring

Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E. Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene

Linde Air Products Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING AND CUTTING GAGES

Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc

Federal Mch. & Welder Co., Warren, Ohlo. General Electric Co., Schenectady, N. Y. Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohlo.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.

Federal Mch. & Welder Co., Warren, Ohio.

WELDING POSITIONER

duMont Corp., Greenfield, Mass.



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

This die head is unique

It cuts threads with insert chasers. These are, in reality, small sections of the business end of large and expensive chasers, but with this important difference: their cost is so low they can be even thrown away when dull. For example, for less than \$40 you can get a dozen sets of insert chasers, each set ground ready to go. Change now to insert chaser die heads and watch your performance improve. "UNIFIED AND AMERICAN SCREW THREAD DIGEST" sent free on request.

THE EASTERN MACHINE SCREW CORPORATION 23-43 Barclay St., New Haven, Conn.

WELDMENTS

Baldwin-Lime-Hamilton Corp., Lima Hamilton Div., Hamilton, Ohio. Federal Machine & Welder Co., Overland Ave., Warren, Ohio. Mahon, R. C., Co., Detroit 34, Mich. Verson Altsteel Press Co., 93rd St. & S. Ken-wood Ave., Chicago, Ill.

WIPERS

Scott Paper Co., Chester, Pa.

American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio. Bethlehem Steel Co., Bethlehem, Pa. U. S. Steel Corp., (American Steel & Wire Co. Div., Columbia Steel Co., Div. Tennessee Coal, Iron & R. R. Co. Div.) 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY

Baird Machine Co., 1700 Stratford Ave., Strat-ford, Conn. U. S. Tool Co., Inc., 255 North 18th St., Am-pere, N. J.

WIRE NAIL MACHINERY

Wire Nail MacHinert

Baird Machine Co., 1700 Stratford Ave., Stratford, Conn.
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.

National Mchry. Co., Greenfield and Stanton Sts. Tiffin, Ohio.
Ryerson, Jos. T. & Son, Inc., 2588 W. 16th St., Chicago, 18, III.

WOODWORKING MACHINERY

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros & Co., 12th and Columbia Aves., Rockford, III.
Mattison Machine Works, Rockford, III.
Onsrud Machine Works, Inc., 3940 Palmer St.,
Chicage, III.

WORM DRIVES

Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio. Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Philodelphia Gear Works, Erie Ave. and G. St., Philodelphia, Pa.

WRENCHES

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Ingersoll-Rand Co. (Impact, Pneumatic, Elec-tric), Phillipsburg, N. J. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Detachable Socket

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Impact

Thor Power Tool Co., Aurora, Illinois

WRENCHES, Pipe

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III.

WRENCHES, Ratchet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

WRENCHES, Top

Butterfield Div., Union Twist Drill Co., Derby Line, Vt. Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass. Greenfield Tap & Die Corp., Greenfield, Mass. Pratt & Whitney, West Hartford 1, Conn. Threadwell Tap & Die Co., Greenfield, Mass.

WRENCHES, Torque Measuring

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, III. Williams, J. H. & Co., 400 Vulcan St., Buffalo 7, N. Y.

New Jersey Zinc Co., 160 Front St., New York,



Users of gain these benefits

FAIRFIELD FROM

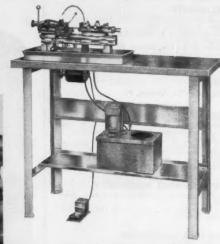
- 1. MASS PRODUCTION ECONOMY Large or small, you get the benefits of high production rates and big volume output at Fairfield-where fine gears are produced to meet your specifications EFFICIENTLY, ECONOMICALLY!
- QUALITY PLUS-There is no finer recommendation for the quality of the product you sell than to be able to say it is "EQUIPPED WITH FAIRFIELD GEARS!"
- DEPENDABLE SOURCE OF SUPPLY Supplier of precision made, automotive type gears for more than thirty-five years to leading builders of construction, agricultural, industrial, marine, and automotive equipment.
- COMPLETE PRODUCTION FACILITIES-Unexcelled facilities in an ultramodern plant for producing Spur, Herringbone, Spiral Bevel, Straight Bevel, Hypoid, Zerol, Worms and Worm Gears, Splined Shafts, and Differentials to your specifications.
- ENGINEERING SERVICE—Fairfield engineers are qualified to make expert recommendations on your gear production requirements. Send for interesting, illustrated bulletin describing Fairfield's facilities.



YOU CAN PRODUCE SMALL INSTRUMENT PARTS WITH MORE ACCURACY - ECONOMY and SPEED

A small precision turret
lathe for second
operations and
production of instrument
parts. Available in two
collet capacities,
5/16" or 3/16". The 6
position turret is selfindexing and has
hardened ways. Turret
holes are 1/2" diameter.
Turret travel 1-5/3".





JEVIN ® TURRET LATHES

The cross slide has a swivel slide at one end and a rigid tool block at the other. Lever collet closer provides quick opening and closing. A variety of turret tools with $1/2^{\prime\prime}$ shanks is available.

Send for catalog M describing complete line of instrument lathes, microdrilling equipment and accessories.

LOUIS LEVIN & SON, INC.

3610 South Broadway

Los Angeles 7, California

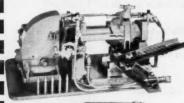


MANUFACTURING COMPANY

549 So. 29th Street, Manitowoc, Wisconsin

ROLL YOUR MARK

WITH *ACROMARK SERIES 9A



MARKING MACHINES

- FAST
- BETTER MARKS
- . MARKS STEEL
- . MARKS PLASTIC

MADE IN VARIOUS MODELS FOR HOT OR COLD MARKING — THE MODERN WAY

COLD marking of steel, stainless steel, other metals and materials is simple with this sturdy, powerful machine. Roller dies mark flat parts and flat dies mark round parts by rolling the part.

Dies last longer. Marks are better. QUIET production is higher. Machines have motor, air or combination drives.

ASK FOR SERIES 9AM MACHINES *Reg. U. S. Pat. Off. HOT marking of painted, baked enameled, and chemically finished metal parts, In COLOR is easy to accomplish FAST in this machine. PLASTIC products that stamping would cruph or otherwise damage are readily marked at high speed in it too.

Ask for Acromark series 9AH marking machines

THE ACROMARK COMPANY

MORRELL ST., ELIZABETH, NEW JERSEY

KAUFMAN

APEX TOOLS

"APEX" HEAVY-DUTY CUTTERS IN STOCK

We carry stock cutters for face milling, slotting or straddle milling. Your inquiries invited.



"APEX" manufactures inserted tools and milling cutters of all styles. Carbide-tipped cutters furnished when required.

APEX TOOL & CUTTER CO., Inc., Shelton 11, Conn.

only



have these exclusive* features

6 Standard Models

Models U-608 and U-1000 -Bail Bearing

Models U-620B and U-10128—Plain Bearing, 11/16" or 1/2" min. centers.

Models U-608-BS and U-1000-BS — Ball Bear-ing Gear Case, Plain Spindles

Semi-Standard Heavy **Duty Full Ball Bearing** /2" in Cast iron — 1 7/16" min. centers 7 1/8" or 9 3/4" Dia.

1/2" in steel—1 13/16" min. centers 7" or 9 5/8" Dia.

Also Larger Adaptations and Full Line of Fixed Conter Drill Heads.

· Standard Full Ball Bearing Construction, including Spindles Driving assembly is FULL BALL BEARING mounted with 3 Bearings on each spindle. Thrust load carried by radial





For accurate setting locating spindle

WRITE FOR FULL INFORMATION

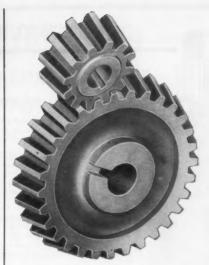


Subsidiary of Thomson Industries, Inc.

THRIFTMASTER Products Corporation

1014 N. PLUM STREET LANCASTER PENNA

Also Makers of DORMAN AUTOMATIC REVERSE TAPPERS



ANGLE BEVEL **GEARS WITH** GENERATED TEETH_{-}

Correct-from every angle! BIL-GRAM angle bevel gears with generated teeth are produced on the latest BILGRAM equipment by specialists with over 70 years' experience in meeting industry's most difficult gear requirements. You can be sure that they are designed right and cut right.

Our complete plant is equipped to produce any kind of gear you need—Bevels of all kinds . . . Ellipticals . . . Herringbones . . . Helicals . . . Racks . . . Spurs . . . Hypoids . . . Worms and Worm Gears. It will pay you to take advantage of BILGRAM engineering service on your next gear problem.



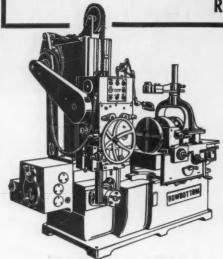
FOR ALL TYPES OF GEARS

BILGRA

Manufacturers of Bevel Gear Generators and Chamfering Machines 1217-35 SPRING GARDEN ST.

PHILADELPHIA 23, PA.

ROWBOTTOM CAM MILLERS and GRINDERS



. . . for fast, economical production of cams of all types and sizes

By taking advantage of Rowbottom's long, specialized experience in the design and production of cam-making machines, you can be certain of the most modern and efficient equipment for handling your needs.

Rowbottom machines include cam millers for milling box, barrel and face cams in sizes up to 32" OD; also cam grinders of the same capacity. An 8-page bulletin describes Rowbottom machines in detail and illustrates a few of the many types of cams being produced regularly on these machines.

If you use cams in the assembly of your equipment, it will be to your advantage to have Rowbottom survey your requirements and ascertain how you can most economically handle your needs . . . whether it will pay you to install machines or have Rowbottom produce your cams and thereby serve as your cam-making department. A study of your needs will provide the answer you are looking for. Get in touch with us now.

Whatever your needs, send us drawings and specifications for our prompt analysis, stating quantity required.

THE ROWBOTTOM MACHINE CO. CONN.

For PRECISION holes in QUANTITY here's a gage with many advantages



COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

Unique Advantages

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging—automatic contenting.
- Shallow holes, deep holes, Inside splines, open-end holes gaged easily.
- Detrets evality, back or front taper, bell mouth, barrel shape.
 Reaches to bottom of blind holes.
- Gages work while still held in chuck.
 A shop tool for all-day every day
- . Portable-ne wires, hoses or

Investigate the gage used by the thousands in jet engine, automotive transmission, household appliance, farm machinery, guided missile and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine for selective assembly. No other like it—investigate and see why.

COMTOR COMPANY

74 Forwell St. WALTHAM 54, MASS.



GET THE FACTS—REQUEST BULLETIN 48



BUILD YOUR OWN

AUTOMATIC DRILLING OR TAPPING MACHINE

With Govro-Nelson Automatic Drilling and Tapping Units, together with the bases and electrical controls which we can supply, you can build yourself an automatic drilling or tapping machine at substantially lower cost than a special machine.

Any number of units may be employed. Examples of the various ways in which they may be arranged are shown at the right.

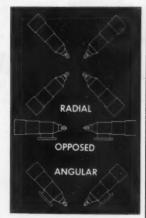
DRILLING UNITS

The Drilling Units are made in several sizes with spindle speeds from 1100 to

3450 RPM. Drill Units have full Hydraulic Control with external adjustment for the rapid approach, the rate of teed and the length of stroke. Suitable for drills up to %", depending on material.

TAPPING UNITS

The Tapping Units are available in two sizes with 550 and 1725 RPM. spindle speed. Features include no clutch and no lead screw and automatic adjustment for various leads. Suitable for tapping 0-80 to %-16, depending on material.



Write for literature

itomatic DRILLING UNIT

GOVRO-NELSON CO.

Machinists of Precision Parts for 33 Years

1933 ANTOINETTE

DETROIT 8, MICH.



DO YOU DO DRY ABRASIVE CUT-OFF WORK?

"Why De Abrasive Cut-Off Wheels Fail? (Sometimes.)"

A 40 page well illustrated informative book giving simple, practical advice on such topics as: speed—spindles—flanges—bearings—hersepower—werk-helding devices and how to care for wheels.

Send \$1.00—cash or stamps

WALLACE TUBE COMPANY

Div. of Wallace Supplies Mfg. Co.

Chicago 14, Illinois

HOBBING SHAPING GENERATING LAPPING SHAVING

WILLIAMSON GEAR & MACHINE CO

MARTHA ST., PHILADELPHIA 25, PA.



Here's outstanding news for all concerned with metalworking in its technical planning and production stages. Now you can have a famous reference book, of long-standing reputation, in entirely modernized form. THE NEW AMERICAN MACHINIST'S HANDBOOK brings you today's practice—today's needed data—in profusion. In it you will find 1579 pages of dependable facts to speed up and simplify your work in shop and drafting room. NEW American Machinists

Edited by RUPERT LE GRAND
Senior Associate Editor, American Mackinist
Based upon earlier editions of
AMERICAN MACHINISTS' HANDOOK
Realer reference
Fully up-to-date
1579 pages
774 (litertalens
45 bly settlens
1579 pages
774 (litertalens
45 bly settlens
1511.00
EASY TERMS!

When the the thick of the thick

PANT PIONEERS IN RIVETING

OVER 50 YEARS' EXPERIENCE

BOTH SPINNER AND HAMMER TYPES Single and Multiple Spindles—Vertical and Horizontal—Automatically or Foot-Operated. Handles rivets from the smallest and most delicate up to ¾" diameter.

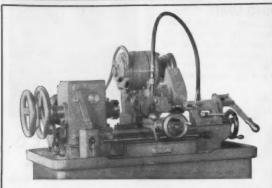
Rotary Vibrating Riveters



THE GRANT MFG. & MACHINE CO.

N.W. Station

Bridgeport 5, Conn.



Noiseless

Spinning

Machines

Rivet

WALTHAM THREAD MILLING MACHINE

For profitable small part thread milling—use the Waltham Thread Miller. We have recently made a number of changes in the design of these machines that add to their operating efficiency and improve their appearance. New pedestal design eliminates need for having access to rear side, permitting machines to be placed back-to-back or against a wall. Spindle speeds are regulated from 0.5 to 5.75 rpm by easily accessible but covered pick-off gears.

These and other important changes are all described in supplementary bulletin M, which illustrates the whole machine. Send for your copy.

WALT HAM TRADE MARK REGISTERED US. PAT. OFF.

MACHINE WORKS

Newton St., Waltham, Mass.





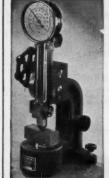
43 Standard Sizes

Forming for All Makes and Sizes of Press Brakes.



DREIS & KRUMP
MANUFACTURING COMPANY
7412 S. Loomis Blvd., Chicago 36, Illinois

CHICAGO



HARDNESS TESTING

Shore-Brinell-Rockwell C

Scales included in our improved Model D Scieroscope. Speedy, accurate, completely portable. No damage to the work. The old standby for fifty years.

WRITE FOR CIRCULAR

THE SHORE INSTRUMENT & MANUFACTURING CO., INC. 90-35 Van Wyck Expressway, Jamaica, 25, M.Y.



R U S S E L L HYDRAULIC SAWING MACHINES

all sizes up to $14^{\prime\prime}$ capacity, with or without automatic stock feed

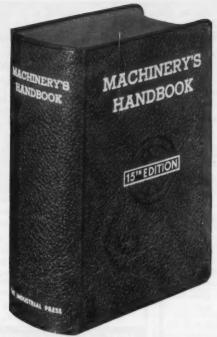
Ask for catalogs

TRIPLEX MACHINE TOOL CORP.
75 West St. New York 6, N. Y.

JIG AND FIXTURE DESIGN

A practical book with 382 pages of information on the design and construction of jigs and fixtures for drilling, boring, planing and milling. \$5 per copy. Sent on approval.

MACHINERY, 93 Worth St., New York 13, N. Y.



The STANDARD Working Tool

for Shop Men . . . Designers . . . Engineers

AUTHORITATIVE • UP TO DATE MOST COMPLETE IN THE FIELD

MACHINERY'S HANDBOOK is on the job everywhere, providing men in every phase of metalworking with the kind of information they need in their daily work.

And this information is constantly kept up to date. For example, in preparing the new 15th Edition, 432 pages of the 14th Edition were revised to include the latest and most authoritative information. Because MACHINERY'S HAND-BOOK is the largest selling handbook in the field, editions are more frequent. You benefit by receiving the latest information—sooner!

Furthermore, volume sales help us keep costs down . . . and we pass these savings on to you! MACHINERY'S HANDBOOK is \$9.00—the biggest \$9.00-worth in the field—an investment that will repay its cost many times over in the wealth of practical, accurate information it puts at your command.

1911 Pages \$9.00 Thumb Indexed

In Canada or overseas, \$10.00

Order your copy today from your bookseller, or directly from the publisher. We pay postage if order is accompanied by payment in full.

THE INDUSTRIAL PRESS

93 Worth St.

New York 13, N. Y.





GEARS

Made to Your Specifications

You and we can form a team—you to draw up the specification; we to make the gears—that will be profitable to both of us. Gears of all types, all sizes, all materials. Design-engineering service available.

Custom Gears Exclusively

DIEFENDORF GEAR CORPORATION

Syracuse 1, N. Y.

DIEFENDORF G E A R S

Classified and Re-Sale Section

astern Rebuilt Machine Tools

THE SIGN OF QUALITY. THE MARK OF DEPENDABILITY

The listing below is only a VERT SMALL AMOUNT of the total number of machine tools that we have in stock for immediate shipment. Our prices are realistic with today's market and our quality of rebuilding is the same high standard—THE LEADER IN THE FIELD OF REBUILD MACHINE TOOLS

"ME LANTER IN 118 FIELD OF REAL CONTROL OF THE CONT

2" Circeland Model A. single spindle, m.d.

BOLT THREADES
Victor Nut Facing Machine, m.d., cap. %" to 2" nuts
11/4" Landis Pointle Spindle, m.d., thru gear box
11/4" Landis 2 spindle, latr type
11/4" Landis 2 s

m.d. No. 326 Outer Bolt & Pipe Threading Machine, m.d.

One Outer Boil & Pipe Threading Machine,
HORIZONTAL BORING MILLS
Barrett Horizontal Boring Machine
No. 257 Giddings & Lewis, m.d., late
Barrett Houble End. 7" and 5" spindles, m.d.
5½" bar Riels-Bennet-Poot, m.d.
6" bar Newton No. 2 Cylinder Borer, m.d.
10" bar Sellen Floor Type, m.d.
Floor Plates—all sizes

Floor Plates—all sizes

VERTICAL BORING MILLS

16" Bullard Mult-All-Malte, m.d.

24" Bullard Solral Drive, 1943

30" King, m.d., 1946

42" King with side head and plain swivel band on rail,

1940

44" Putnam. m.d., p.r.t.

44" Niles, m.d., p.r.t.

44" Niles, m.d., p.r.t.

48" Niles Bement-Pont Car Wheel Barer, m.d.

53" Niles Heavy Pattern, m.d., p.r.t.

100" Niles Heavy, m.d., p.r.t.

102" Niles Wheel Turning Boring Mill

12" Niles, m.d., p.r.t.

BROACHING MACHINES

BROACHING MACHINES

BEOACHING MACHINES

75 H.P. LaPointe Hydraulie Brosch. m.d.
12x72" Thompson Automatic Flat Broach, m.d.
10 ton, 84" stroke Single Ram Vertical Surface Broach,
LaPointe, m.d., late
Type SBD-42-6 American Vertical Hy. Dup. Broach
Type SBD-48-15 American Vertical Dual Ram Surface
Hydr. Broach
Olizara Hydraulie Broach, type EA. 54" stroke. m.d. Hydr. Broach Oilgear Hydraulic Broach, type EA, 54" strobe, m.d. Type 3L8 LaPointe Horiz. Hydraulic, m.d.

Type 3L8 LaPointe Horiz. Hydraulic, m.d.

2"—9" col. Fosdick, m.d.
2½"—10" col. American Triple Purpose, m.d.
3"—1" col. Cinc.nati-Rickford, m.d.
3"—1" col. Fosdick "Economax," m.d., late
5"—14" col. Carlton, m.d.
7"—16" col. American Triple Purpose, m.d.
7"—17" col. American Triple Purpose
8"—17" col. American Triple Purpose

8'-17" cel. Drenes, gear box m.d. Zewo Precision Universal Bench Type Radials, m.d., new Baush Radial Drilling & Tapping Machine, m.d.

Bamb Radia Brilling & Tapping Machine, m.d.

No. 2 Avey Single Spindle, m.d.

No. 2 Avey Single Spindle, m.d.

No. 2 Mas Avey High Speed, m.d., 7\frac{1}{2}" overhang, 1943

No. 18 Canced Victo Berch Model, m.d.

No. 18 Edind, m.d., new

No. 18 Edind, m.d., new

No. 2 Avey Single Spindle, m.d.

No. 18 Edind, m.d., new

No. 2 May Single Spindle, m.d.

2 spindle Allen, belted, m.d., 8" overhang

No. 1MS Lichand-Gifford, single spindle, High Speed, m.d.

2 spindle Avey, size No. 1, type B, style VER, m.d., 8" overhang

2 spindle No. 2MAS Avey High Speed, m.d.

3 spindle No. 2 MAS Avey High Speed, m.d.

3 spindle No. 2 Liand & Gifford High Speed, 8" overhang, m.d.

3 spindle No. 2 Liand & Gifford High Speed, 8" overhang, m.d.

3 spindle No. 2 Liand & Gifford High Speed, 8" overhang, m.d.

3 spindle Leland & Gifford #ILMS—High Speed, late, m.d.

3 spindle Leland & Gifford High Speed, M.d.

taper 4 spindle No. 4 Allen High Speed, m.d., 1943

4 spindle No. 4 Allen High Speed, m.d., 1943

HORIZONTAL DRILLS

3 way Nates Horizontal Drill, consisting of 3 E13

Holeumita
No. ½820 Pratt & Whitney Gun Barrel Rifling Machine, m.d., latest
No. 18214 Pratt & Whitney 2 spindle Deep Hole Reaming Machine, m.d.
No. 172105 Pratt & Whitney 2 spindle Gun Barrel
Rifling Machine, m.d.
No. 1 Pratt & Whitney 2 spindle Deep Hole Drill,
helted, m.d.
Model 410 W. F. & John Barnes 2 spindle Hydraulic
Deep Hole Drill, m.d.
Pratt & Whitney Deep Hole Drill Sharpener, m.d.
Natco Horizontal Drill, helestel model, m.d., 1942

MULTIPLE SPINDLE DRILLS

MULTIPLE PRINCE PRILLS

Barnes All Ge-red Seif-Oling, 3 spindles, m.d.

##115U Moline Multiple Spindle Drill Press
No. 3 Baush, m.d., 16x30" head
3 spindle 29" Cincinnati Bickford Upright Drill, m.d.,
No. 4 M.T.

Applofile Niles-Bement-Pont, m.d., 12" rail, No. 5

No. 5 al., 1818-Bement-Pont, m.d., 12' rail, No. 5 Tayler, No. 5 Tayler,

UPRIGHT DRILLS

D4 Colburn, m.d.
D6 Colburn Heavy Dufy, m.d.
D6 Colburn Heavy Dufy, m.d.
20" Clucinnati Bickford Super-Service Prod. Drill, m.d.
24" Aurora, m.d.
24" Clucinnati-Bickford, m.d.
32" Aurora, belt drive
36" Clucinnati Bickford, belt drive
No. 2 Colburn Mfg. Type, m.d.

The above is only a partial listing WRITE FOR COMPLETE STOCK LISTING

EASTERN MACHINERY COMPANY

squering SHEAR FOR SALE
Johnson, Model A-26, Serial No. 52001 hydraulic power squering sheor, 10 gauge capacity, 6 fort 4 inch length of cut, 18 inch throat depth, 24 inch back gauge range and 45 inch front gauge range. Equipped with 10 hp., 1200 r.p.m., 3-phase, 60 cycle, 220-440 volt motor. New condition—used less than sixty davs.

WELLS SPECIALTY, INC.
North Liberty, Indiane

EXECUTIVE SALES ENGINEER

Experienced specialist in power transmission equipment; precision bearings: gearing and speed reducers; conveyors; etc. seeks connection for greater New York area as district manager or sales representative.

Write Box 698, MACHINERY 93 Worth St., New York 13, N.Y.

REPRESENTATIVES WANTED

Available, a complete line of Mist Coolant Systems. Territories open in many industrial areas, Brier Mist, 717 S. Boulevard, Oak Park, Illinois,

NEW 2nd PRINTING

MACHINE TOOL RECONDITIONING & the Art of Hand Scraping

Write for folder describing illustrated book Machine Tool Publications 215 Commerce Bldg., South Wabash St. St. Paul 1, Minn.

"LATE MODEL MACHINE TOOLS"

AUTOMATIC, 2%" 6 spindle Aeme-Gridley, new 1941.
GRINDERS, CYLINDRICAL, 4" x 18" Ginelmati Piain byd. 1945.
GRINDERS, CYLINDRICAL, 6" x 18" Lundis, 300Head, New 1941.
GRINDERS, CYLINDRICAL, 10" x 18" Cincinnati ER piain byd. 1946.
GRINDERS, CYLINDRICAL, 16" x 96" Lundis type 8, 48" sap. new 1941.
GRINDERS, CYLINDRICAL, 6" x 30" Cincinnati EA Filmatic piange set (2) 1942-1945.
GRINDERS, SURFACE, 14" x 36" Pratt & Whitney wert 1961. 1942.
GRINDERS, SURFACE, 43" No. 16A2 Slanchard GRINDERS, SURFACE, 72" No. 72 Hanchett rotary, new 1946.
HATHES, EMBINE, 14" x 6" bed Handey toolroom, LATHES, ENGINE, 4" x 6" bed Handey toolroom. GRINDERS, SURFACE, 72" Ms. 72 Hannest retary, new 13-6.
LATHES, ENGINE, 14" x 6" bed Hendey toolroom, Timken, 13-90.
LATHES, ENGINE, 16" x 30" Monarch, Model CY, new 13-92.
LATHES, ENGINE, 20" x 67" Axelson Neavy Duty Model, new 13-91.
LATHES, ENGINE, 36" x 13" Centers Monarch, Model NN, new 13-92.
LATHES, ENGINE, 36" x 13" Centers Monarch, Model NN, new 13-92. LATHES, TURRET, 36" and 42" Bullard New Era vertical: vertical:

NILL No. 3-H Kearney & Trecker pinin, horizontal,
ntw 1942.

NIL No. 4 Cincinnati Hi power pinin herizontal.

PLANERS, 36" Rockford Hydraelie Openside ShaperPlaner, late type.

NEARS, Power Squaring, 96" x 10 gauge Bliss.

WRITE FOR ILLUSTRATED CATALOG OF 1000 MACHINE TOOLS

MILES MACHINERY COMPANY

2045 E. Genesee Ave. Telephone—Saginaw 2-3105 SAGINAW, MICHIGAN

OFFERED FOR SALE MACHINE TOOL MANUFACTURERS OF TURRET RAM TYPE VERTICAL MILLER MACHINE

We will sell patterns, jigs, fixtures, prints and all rights to manufacture our line of millers.

Our line is well established throughout the United States by a great number of active dealers supplying more orders that we can take care of at present.

We find ourselves in the position to greatly expand our facilities or to sell out this machine line we manufacture. Write Box 699, Machinery, 93 Worth St., New York 13, N.Y.

MACHINE TOOLS

6' arm 19" Column CARLTON MOTOR ON ARM RADIAL Drill Press, Late Type, Power Rapid Traverse 20 HP 3/60/220/440 Motor and Mag-netic Controls.

FALK MACHINERY CO.

19 Ward Street - BA 5887 - Rochester, N. Y.

FOR SALE

Williams, White & Co. Model 27 Buildozer with Model 28 Crosshead Walght 39,000 lbs. Electric Motor-25 H.P.

sectric Motor—25 H.P. Strokes per Min.—8 Condition excellent—very slight use—in service now Sales Price (loaded on flat ear)—\$7500 Available for immediate delivery.

Sundstrand Rigid Mill No. 1-Serial No. 31-40. Converted to B type head. Includes motors, controls, arbor, 2 overcem arbor supports, coolant pump and piping-R.P.M .- Maximum 2500 Condition-Perfect Very slight are on small alaminum job Sales Price f.e.b. factory — \$3000



This 2500 pound steel spur gear of manganese moly stock, was fabricated by Stahl for tough, exacting service in a steel rolling mill. For all your gear needs, large or small, in any quantity, benefit from Stahl's many years of precision gear manufacture-your inquiry will get prompt attention

BEVELS TO 54" PD, 1 DP SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP CONTINUOUS-TOOTH HERRINGBONE TO 60° PD, 2 DP SPROCKETS TO 72" PD, 21/2" CP RACKS TO 20 FT. LONG, 3 DP SILENT GEARS; RAWHIDE, BAKELITE, FIBROIL

SPURS TO 72" PD, 1 DP

HEAT-TREATED, CASE OR FLAME HARDENED GEARS OF CARBON OR ALLOY STEEL

GEAR & MACHINE COMPANY 3901 Hamilton Ave. Cleveland 14, Ohio



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company lette THE DYKEM COMPANY
2303R North 11th St. . St. Louis 6, Mo.

DYKEM HI-5POT BLUE No. 187 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit, noninjuribute to the second of the second control of the sec



IMPROVE FACING OPERATIONS

ON BORING MILLS - DRILLS - LATHES MILLERS AND RADIALS

M-D facing Head feeds automatically. Lathe tool bit travels radially from center autoward or reverse. 10 sizes, 6" to 46" dia. Write for bulletin, prices.

MUMMERT-DIXON CO. 126 Philadelphia St. HANOVER, PA.

For more information fill in page number on Inquiry Card, on page 221

OPERATION is made possible

by the Davis tilting table, which permits even work tapering as much as 3" per foot to be set up and cut quickly. And Davis multiple tooth cutters make quick work of all keyways up to 1" in width.

Let us work out setups to speed up your production.

Write for Bulletin

DAVIS COMPANY

405 EXCHANGE ST. ROCHESTER 8. N. Y.



In this new M & M Keyseater hydraulic action produces exceptionally smooth performance. Cutter stroke and feed are automatically controlled, tool relief is also automatic. High degree of accuracy is assured. Available in a wide range of sizes. Rugged construction fea-tures insuring long life are based on 67 years experience. Mechanical drive keyseaters available for cutting keyways in all sizes up to 5" wide and 60" long. Write for specification folder. 90.8

MITTS & MERRILL

64 Holden Street * SAGINAW, MICHIGAN

MACHINERY, January, 1956-341



At Ford Instrument Co., the answer is Leland-Gifford Drilling Machines

Problems involving precision mechanisms are duck soup for Ford Instrument Company, Division of Sperry Rand Corporation. They have the talent and the equipment to produce the right answers in the simplest and most practicable form.

Among their equipment is this battery of Leland-Gifford multiple spindle drilling machines. Here precision drilling operations are handled with efficiency and dispatch.

The right tools are ready for use in the right

sequence and combination for drilling, reaming, tapping, countersinking, counterboring or spot facing. Work moves smoothly from one spindle to the next, requires a minimum of handling even for the most complex pattern of

Leland-Gifford multiple spindle drilling machines are available in a complete family of sizes and in a wide range of swings, number of spindles and types of feed. New bulletins give complete information. Write for them.

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.

CHICAGO 45 2515 West Peterson Ave. 10429 West McNichols Rd.

75 South Orange Av South Orange, N. J. LOS ANGELES OFFICE 2620 Leonis Blvd. P.O. Box 853 INDIANAPOLIS 6, P. O. Box 1051

ROCHESTER 12, P. O. Box 24, Charlotte Station

ALPHABETICAL INDEX OF ADVERTISERS

A	Cincinnati Grinders Incorporated 6-7	G	Linde Air Products Co., Div. Union Carbide and Carbon
5. 6. 955	Cincinnati Lathe & Tool		Corp 34
Abbey Etna Co 255	Co 92-93	Gallmeyer & Livingston Co 209	Lodge & Shipley Co., The 247
Ace Drill Corp 320	Cincinnati Milling Products	Gardner Machine Co 25	Logansport Machine Co., Inc. 273
Acromark Company, The 334	Div., Cincinnati Milling	Garlock Packing Co 329	Lucas Machine Div., New
Allegheny Ludlum Steel	Machine Co 27-107	Gear Grinding Machine	Britain Machine Co.,
Corp 84	Cincinnati Shaper Co 38-39	Co 279-301	The 114-115
Allen-Bradley Co.		Giddings & Lewis Machine	THE MANAGEMENT AND AND
Insert bet. 34-35	Circular Tool Co., Inc 248	Tool Co 22-23	
	Cities Service Oil Co 101	Gisholt Machine Co 244-245	M
American Brass Co 37	Classified Advts 340		242
American Broach & Mch.	Clearing Machine Corp., Div.	Gleason Works 299	
Co Insert 67-82	U. S. Industries Inc 95	Goss & DeLeeuw Mch. Co. 254	Madison-Kipp Corp 331
American Felt Co 54	Cleveland Crane & Engrg.	Govro-Nelson Co 337	
American Society of Tool	Co	Grant Mfg. & Machine Co 338	Materials Section 83-90
Engineers Insert bet. 90-91	Colonial Broach & Mch. Co. 40	Gray, G. A., Co 55	Mattison Machine Works
American Tool Works Co 43		Graymills Corp 304	Insert 67-82
Ames, B. C., Co 250	Columbus Die-Tool & Mch.	Greenlee Bros. & Co.	McGraw-Hill Book Co 337
Apex Tool & Cutter Co.,	Co 287	Insert 67-82	Mercury Engineering Corp. 251
	Comtor Co 336	THISCIT OF-ON	Metal Carbides Corp 336
Inc 335	Cone Automatic Mch. Co.,		Michigan Drill Head Co 52
Armstrong-Blum Mfg. Co 32	Inc 105	-	Michigan Tool Co 241
Armstrong Bros. Tool	Continental Tool Wks. Div.	H	
Co Front Cover	of Ex-Cell-O Corp 235		Millholland, W. K.
Arter Grinding Mch. Co 292	Cross Company 232-233		Machinery Co., Inc 284
Austin Industrial Corp 45		Hamilton Tool Co 309-310-311	Mitts & Merrill 341
Avey Drilling Mch. Co 110-111	Crucible Steel Co. of	Hanchett-Magna-Lock Corp. 276	Modern Machine Tool Co 306
Avey Drining Men. Co 110-111	America 83-89-109	Hannifin Corporation 303	Moline Tool Co 298
	Cumberland Steel Co 88	Hardinge Brothers, Inc 120	Motch & Merryweather
		Heald Machine Co., The	Mchry Co 291
В			Mummert-Dixon Co 341
		Inside Front Cover	Millimett-Dixon Co 541
	D	Heller Tool Co 289	
Baird Machine Co.		Hill Acme Co 96	
Inside Back Cover		Horsburgh & Scott Co 256	N
Baldwin-Lima-Hamilton	Dake Corporation 300	Horton Chuck 246	
Corp 257	Danly Mch. Specialties, Inc. 57	Hydraulic Press Mfg.	Marianal Automobile Tool Co
Ball & Roller Bearing Co 337	Davis Boring Tool Div.,	Co 268-269	National Automatic Tool Co.,
Ball & Roller Dearing Co 551		0.01	Inc 112-113
Barber-Colman Co. Insert 67-82	Giddings & Lewis Mch.		National Broach & Mch. Co. 63
Bardons & Oliver, Inc 116-117	Tool Co 44		National Tube Div., United
Barnes Drill Co Insert 67-82	Davis Keyseater Co 341	I	States Steel Corp 271
Barnes, John S., Corp.	Denison Engineering Co 313		National Twist Drill & Tool
Insert 67-82	Detroit Broach Co 108		Co
Barnes, W. F. & John Co.	Dialight Corporation 272	Illinois Gear & Machine Co. 263	New Britain Machine Co.,
Insert 67-82	Diefendorf Gear Corp 339	Industrial Press 302	
Baush Machine Tool Co 61	Dreis & Krump Mfg. Co 338		The 114-115
	du Mont Corporation 330		New Departure, Div. General
Bethlehem Steel Co 85-90		J	Motors 319
Bilgram Gear & Machine	Dykem Co 341	,	New Jersey Gear & Mfg. Co. 343
Works 335			Niagara Machine & Tool
Blanchard Machine Co 42		T 0. T Nr1.1	Works 18-19
Brad Foote Gear Works,		Jones & Lamson Machine	Nichols-Morris Corp 100
Inc 314	E	Co 98-99	
			Norton Company 14-15-46-47
Brown & Sharpe Mfg. Co 206-207			
	Eastern Mch. Screw Corp 332	K	
Bryant Chucking Grinder		К	0
Bryant Chucking Grinder Co	Eisler Engineering Co., Inc. 343	К	0
Bryant Chucking Grinder Co	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co.		0
Bryant Chucking Grinder 238 Co. 238 Buffalo Forge Co. 62	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co. Insert 67-82	Kaufman Manufacturing Co. 334	Oakite Products, Inc 86
Bryant Chucking Grinder 238	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co., Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334	Oakite Products, Inc 86
Bryant Chucking Grinder 238 Co. 238 Buffalo Forge Co. 62	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co., Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334	Oakite Products, Inc
Bryant Chucking Grinder 238	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co., Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334	Oakite Products, Inc 86
Bryant Chucking Grinder 238 Co. 238 Buffalo Forge Co. 62 Buhr Machine Tool Co. 214 Bullard Co. 33	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co., Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334	Oakite Products, Inc
Bryant Chucking Grinder 238	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334	Oakite Products, Inc
Bryant Chucking Grinder 238 Co. 238 Buffalo Forge Co. 62 Buhr Machine Tool Co. 214 Bullard Co. 33	Eisler Engineering Co., Inc. 343 Ekstrom, Carlson & Co., Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder Co	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 10-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 10-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich. 48 Ex-Cell-O Corp. 213-235 F Fairfield Manufacturing Co. 333 Farquhar, A. B. Div., The Oliver Corp. 315 Farrel-Birmingham Co., Inc. 253 Farval Corp. 49 Federal Press Co. 249	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc
Bryant Chucking Grinder	Eisler Engineering Co., Înc. 343 Ekstrom, Carlson & Co. Insert 67-82 Elox Corp. of Mich	Kaufman Manufacturing Co. 334 Kearney & Trecker Corp 16-17 Kennametal, Inc	Oakite Products, Inc



GEARS -ALL MAKES . . . Special and Standard

PRECISION GEARS UP TO 200 DIAMETRAL PITCH
All Gears certified for Accuracy
Quality and Fine Workmanship

NEW JERSEY GEAR & MFG. CO. 1470 Chestnut Ave. Hillside, N. J.

ALPHABETICAL INDEX OF ADVERTISERS

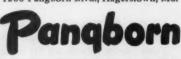
R	Shore Instrument & Mfg. Co., Inc	Timken Roller Bearing Co. Back Cover	Viking Pump Co
R & L Tools	Simonds Abrasive Co	Timken Roller Bearing Co. Steel & Tube Div	Corp 50
Insert 67-82 Revere Copper & Brass, Inc. 229	Snow Manufacturing Co 297 Snyder Tool & Engrg. Co. 30-31 South Bend Lathe Works 102	Triplex Machine Tool Corp. 338 Twin Disc Clutch Co 324	Wadell Equipment Co 261
Rockford Clutch Div. Borg-Warner	Springfield Machine Tool Co. 91 Stahl Gear & Machine Co 341 Standard Electrical Tool Co. 286	U	Waldes Kohinoor, Inc 260 Wales-Strippet Corp 281 Walker, O. S., Co., Inc 266
Rollway Bearing Co., Inc 325 Ross Operating Valve Co 225	Standard Gage Co., Inc 66 Standard Oil Co. (Indiana) 58-59 Standard Pressed Steel Co. 24-94	U. S. Tool Company, Inc. 12-13 Union Carbide & Carbon	Wallace Tube Co., Div. Wallace Supplies Mfg. Co. 337 Walls Sales Corp
Rowbottom Machine Co 336 Russell, Holbrook & Henderson, Inc	Starrett, L. S., Co	Corp., Linde Air Products Co., Div	Waltham Machine Works 338 Warner & Swasey Co 28-29 West Disinfecting Co 296
Ruthman Machinery Co 316 Ryerson, Joseph T. & Son, Inc	Sundstrand Machine Tool Co	United States Steel Corp 271 Universal Engineering Co 267 Used Machinery	Wheelock, Lovejoy & Co., Inc. 288 Wiedemann Machine Co. 278
s	Swanson Tool & Mch. Products, Inc	v	Williamson Gear & Mch. Co. 337 Williams, J. H. & Co
5	T		Winzeler Manufacturing & Tool Co,
Scherr, Geo. Co., Inc	Texas Company	Van Norman Co	Z
Shell Oil Co 265	Corp 335		Zagar Tool, Inc 258

"This Pangborn Dust Book is ruining us Dust Hogs!"

No wonder the Dust Hog is unhappy! More and more plants across the country are sending for their free copy of Pangborn's "Out of the Realm of Dust" and discovering how to put the Dust Hog out of business.

How about the Dust Hog in your plant? He's that sneaky fellow responsible for the loss of valuable material that goes up in dust... for uncontrolled dust that harms machinery, impairs working conditions, spoils community relations, lowers employee morale, raises housekeeping costs. Let us show you how Pangborn Dust Control puts a stop to that.

YOURS FOR THE ASKING! Send for your free copy of "Out of the Realm of Dust" today. It will show you how Pangborn Dry or Wet Dust Collectors can solve your dust problem and save you time, trouble and money. Write to PANGBORN CORP., 1200 Pangborn Blvd., Hagerstown, Md.



CONTROLS DUST



PANGBORN-MANUFACTURERS OF DUST CONTROL AND BLAST CLEANING EQUIPMENT

1st in a Series . . .

OF HIGH PRODUCTION CASE HISTORIES

ABOUT IT

8 OPERATIONS operations

ON HEAD CASE

OF COLD DRAWN MILD STEEL

Production . . .

198 PIECES PER HOUR

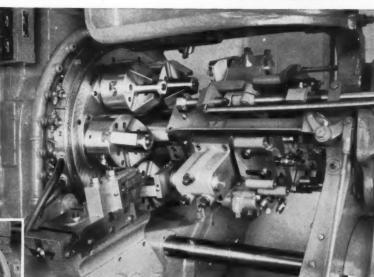
The machine tooled for production of these parts at extremely low cost is the Baird 76H Automatic Chucking Machine.

Operations are: rough and finish turn the smaller O.D. . . . face the shoulder . . . rough and finish larger

O.D. for threading . . . face the end, cut recess for threading die and chamfer the ends. Prevention of tool marks on the finished surfaces is assured by indexing the work away from the tools at the conclusion of the cutting.

Even though you may not have Head Cases to finish, there are many similar jobs that can be produced at most favorable competitive costs on the Baird Chucker with high speed tooling set-ups. "Ask Baird about it." Write Dept.





(Above) Front view of tooling showing 4 of the 6 chucks. (Left) Rear view of the tooling.

THE BAIRD MACHINE COMPANY STRATFORD

CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS . AUTOMATIC WHE & RISSON METAL FORMING MACHINES . AUTOMATIC PRESSES . TUMBLING SARRELS

How high load capacity is built into less space in Dodge-TIMKEN All-Steel pillow block

THIS rugged Dodge-Timken pillow block packs more capacity in less space than ever before. All-steel construction gives it extra strength and durability. The design is compact. No special thrust devices that take up extra space are needed—the two-row Timken® tapered roller bearing takes both radial and thrust loads in any combination. And full line contact between the rollers and races assures high load capacity.

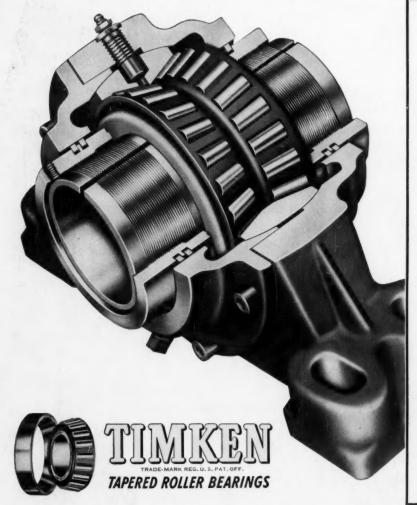
The cutaway view below shows the bearing. It is of special design, with tapered bore and self-aligning spherical outer surface—never requires adjustment. As in all Timken bearings, races and rollers are case-carburized and have tough, shock-resistant cores under hard, wear-resistant surfaces. Under normal conditions, the Timken bearing will last the life of the machinery with which the pillow block is used.

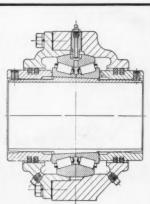
In addition to the all-steel pillow block shown here, Timken bearings are also used in the Type "E", Double-Interlock, Type "C", and Special-Duty pillow blocks—other versatile pillow blocks in the Dodge-Timken line with a wide variety of uses in industry.

To be sure of the finest bearing steel, we make our own—America's only bearing manufacturer that does. No other bearings can give you all the advantages you get with Timken bearings. Include them in your design plans...specify them for the machines you buy or build. Look for the trademark "Timken"—it's on the bearing that makes any machine run better. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable: "TIMROSCO".



This symbol on a product means its bearings are the best.





How DODGE MANUFACTURING CORPORATION, Mishawaka, Ind., mounts Timken bearings in the Dodge-Timken All-Steel pillow block. Above: non-expansion block with fixed bearing. Below: expansion block with floating bearing.

